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ZOOLOGICAL SERIES

OF

FIELD MUSEUM OF NATURAL HISTORY

Volume 24 CHICAGO, JANUARY 30, 1939 No. 1

NEW CENTRAL AMERICAN FROGS OF THE GENUS HYPOPACHUS

BY KARL P. SCHMIDT
CURATOR OF REPTILES AND AMPHIBIANS

In the course of studies on the amphibian fauna of upper Central America, the frogs of the microhylid genus *Hypopachus* from that region in the reference collection of Field Museum have been reexamined. Some of these had been identified cursorily long before the appearance of Parker's comprehensive review of the Microhylidae.[1] With Parker's monograph at hand, obvious discrepancies in characteristics and distributions are evident. Our seven Guatemalan specimens represent three species and three zoological expeditions. The form most distinct from any known species was collected by C. M. Barber while on the Field Museum Guatemalan Expedition of 1906. Mr. Barber, who accompanied Edmund Heller in the Mexican and Guatemalan field work of the Museum in 1904, 1905, and 1906, will be remembered as the collector of *Oedipus rex*, the highland salamander of the Guatemalan plateau. The Museum owes many valued specimens of reptiles and amphibians to his interest in these creatures. Two specimens of a large smooth-skinned species were obtained by Leon L. Walters and myself in Honduras in our field work for the Marshall Field Central American Expedition of 1923. Topotypes of *Hypopachus inguinalis*, without which the other forms could scarcely have been defined, were obtained by my brother, the late F. J. W. Schmidt, and myself, while on the Mandel Guatemalan Expedition in 1933-34. The Museum is indebted to Mr. Albert A. Enzenbacher for the pencil drawings which illustrate the present paper.

Hypopachus barberi sp. nov.

Type from Tecpan, Sololá, Guatemala. No. 1812 Field Museum of Natural History. Adult female. Collected by C. M. Barber.

[1] H. W. Parker, A Monograph of the Frogs of the Family Microhylidae. British Museum (Natural History), London, pp. VIII+208, 67 figs., 1934.

Diagnosis.—Metatarsal tubercles both present, both rounded; dorsum covered with rounded warts; snout not prominent; most closely allied to *Hypopachus inguinalis*, from which it is distinguished by the rough skin, relatively small head, and strong fold across the throat.

Description of type.—Body form of *Hypopachus;* snout little prominent, as long as the eye; canthus rostralis moderately distinct, the loreal region flat; interorbital space nearly twice as broad as upper eyelid; fingers free, the second exactly as long as the fourth; toes with a vestige of web, the third decidedly longer than the fifth; two prominent rounded metatarsal tubercles, the inner larger, neither with a cutting edge, subarticular tubercles well developed, two under the fourth toe.

Skin smooth below, warty above; a transverse fold crosses the head behind the eyes, connecting with an oblique fold from the posterior corner of the eye to beneath the arm; a strong fold across the throat joins the oblique folds above and behind the ricti.

Color uniform dull brown above except for a prominent ocellar spot above the thighs, which matches transverse black bars on the flexed tibial and metatarsal joints; a narrow light mid-dorsal line connecting with one on the posterior face of the hind limb on each side; under surfaces yellowish brown, mottled with dark brown, which is bolder on the posterior part of the belly; an oblique light stripe from the eye just in front of the oblique skin fold.

Measurements.—Length from snout to anus 36.6; snout to upper transverse fold 5.7; width of head at ricti 11.5; hind limb from anus 49; tibia 15.5; foot from metatarsal tubercles 17.4; arm 19.

Remarks.—This species is amply distinguished from all others in the genus *Hypopachus* by its warty back and the fold of skin across the throat. I take especial pleasure in naming it for my friend C. M. Barber, of Hot Springs, Arkansas. Mr. Barber made the first herpetological collections for Field Museum in Guatemala, and was still cordially remembered by Don Axel Pira at the Hacienda Santa Elena (above Tecpan, the type locality of the present species), when my brother and I visited Santa Elena nearly thirty years later, to be befriended in our turn.

Hypopachus globulosus sp. nov.

Type from Lake Ticamaya, east of San Pedro Sula, Honduras. No. 4641 Field Museum of Natural History. Adult female. Collected April 16, 1923, by Karl P. Schmidt and Leon L. Walters.

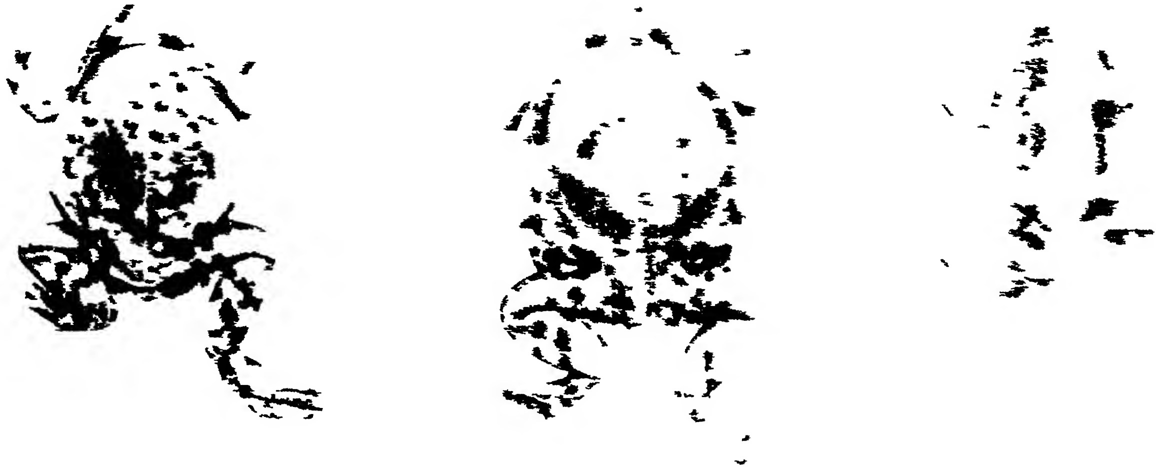

FIG 1 *Hypopachus barberi*, type (left), × 1, *H globulosus*, type (center), × 1, *H inguinalis*, topotype (right), × 1

Diagnosis.—A *Hypopachus* with extremely globose body, very small head, smooth skin, outer metatarsal tubercles little compressed, and prominent inguinal spots; allied to *Hypopachus inguinalis*, from which it is distinguished by its very much shorter limbs, relatively smaller head, and less bold ventral coloration.

Description of type.—Body extremely globose, with short hind limbs and small head; snout scarcely longer than the diameter of the eye, with rounded canthi; interorbital space twice the width of the upper eyelid; fingers free, the second equal in length to the fourth, the third elongate; toes free, the vestige of web tubercle-like between the toes; subarticular tubercles well developed, three under the fourth toe; outer metatarsal tubercles prominent, rounded, the inner oval and slightly compressed, but without cutting edge; tarsometatarsal articulation falling short of the eye, reaching about to the axilla.

Skin smooth above and below; a transverse fold on the head behind the eyes, confluent with oblique folds from the posterior corners of the eyes to below the arms.

Color dark brown above, with a tinge of fawn; somewhat obscure black markings on the shoulders and anterior part of the dorsum; an oblique yellowish marking from the eye, with a small black spot; a well-developed light spot above the thighs, strongly outlined with black, and merging with the red and black mottling of the posterior face of the thighs; a narrow light line from tip of snout to above anus, connecting with one on the posterior faces of the legs; under surface brownish gray, with yellowish gray spots; a light line from the chin connects on the breast with oblique branches extending to the axillae.

Measurements.—Length from snout to anus 39.5; snout to transverse fold on head 5.5; width of head at ricti 11; hind limb from anus 50; tibia 15.9; foot from metatarsal tubercle 17.5; arm 21.5.

Notes on paratype.—A second specimen, No. 4642, comes from the same locality as the type; it agrees in general proportions and size with the description above; the ventral maculation is bolder.

Remarks.—I identified this form as *Hypopachus inguinalis* on my return from Honduras in 1923, and failed to note its distinctness from that form until topotypes of *inguinalis* were obtained in 1934.

Hypopachus inguinalis Cope.

Hypopachus inguinalis Cope, Proc. Amer. Phil. Soc., 11, p. 166, 1869—Coban, Guatemala.

Four topotypes of this species are in Field Museum, taken April 15, 1934. These measure only about 25 mm. from snout to

vent, and are accordingly only two-thirds the size given by Parker (1934, p. 112). It is not impossible that there may be a larger form at lower altitudes in the extremely diversified terrain of "Verapaz." All specimens known from Coban seem to correspond with ours in size. There are two subarticular tubercles on the fourth toe, as in *barberi; globulosus* has three more prominent tubercles.

It seems likely that the Coban specimen, also "half-grown," referred by Parker to the west Mexican *oxyrhinus*, should be placed with *inguinalis*, or that some confusion of data has taken place in the specimens in the Naturhistorisches Museum in Vienna.

I take the occasion to make a trivial correction of a statement on page 112 of Parker's monograph; the specimen No. 49673 from Natal, Brazil, listed as "F.M.N.H." belongs to the California Academy of Sciences. It was on loan to Field Museum, and identified for me by Mr. Parker in 1932.

ZOOLOGICAL SERIES
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A NEW LIZARD FROM MEXICO
WITH A NOTE ON THE GENUS NOROPS

BY KARL P. SCHMIDT
CURATOR OF REPTILES AND AMPHIBIANS

A large anole, submitted to me for examination by Mr. H. W. Parker of the British Museum (Natural History), appears to be undescribed, and in some particulars remarkable. At Mr. Parker's suggestion, and with his concurrent opinion that the specimen represents a new species, I have drawn up the following description. We are indebted to Mr. Albert A. Enzenbacher for the pencil sketches which illustrate the new form.

Anolis barkeri sp. nov.

Type from Cascajal, Upper Uzpanapa River, Vera Cruz, Mexico. No. 36. 6. 6. 12 British Museum (Natural History). Adult male. Collected by R. Wright Barker.

Diagnosis.—A large *Anolis* with compressed body, allied to *Anolis jacare.* A very large throat-fan; the supraorbital semicircles well developed, separated by two or three scales; occipital enlarged, separated from the semicircles by four scales; dorsal scales small, keeled; laterals smaller, smooth, and ventrals a little larger, keeled; tail compressed, with two rows of scales forming the dorsal carination; a light lateral stripe.

Description of type. Body stocky, head moderately large, a little longer (from snout to ear opening) than the tibia; limbs strong, the knee not reaching the elbow, the longest toe reaching the eye; tail compressed, with a sharp dorsal edge, slightly crenulate in correspondence with the spines of the vertebrae, without a crest.

Frontal ridges obscure, forehead hollow; head scales wrinkled rather than keeled; rostral low and wide; nine scales between the nostrils; supraorbital semicircles well marked, separated by two rows of scales, occipital enlarged, but smaller than the ear opening, separated from the semicircles by four rows of scales; supraorbital

disk composed of six or seven flat scales, faintly rugose or keeled, the larger internal row in direct contact with the semicircles; superciliaries continuous with the canthals anteriorly, not clearly distinguishable from the supraocular granules posteriorly; one anterior superciliary enlarged; canthus rostralis sharp; loreal rows seven; subocular semicircle in contact with the labials; 11 upper labials; 13 lower labials; temporals small, uniform, and smooth.

Dorsal scales faintly keeled, slightly larger than the smooth laterals; ventrals a little larger than the dorsals, faintly keeled; 40

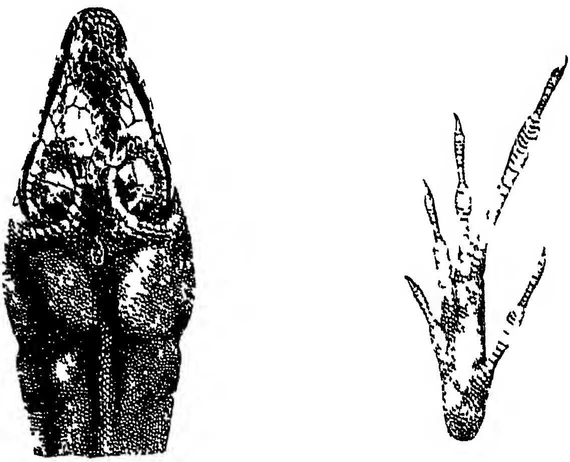

FIG. 2. *Anolis barkeri*, type. Head from above, × 2; under surface of foot, × 2.

dorsal scales equal the length from tip of snout to occipital; caudal scales keeled, in verticils, each of about eight rings of scales; two continuous rows of scales form the dorsal carination of the tail.

Scales of anterior surfaces of limbs sharply keeled; 23 lamellae beneath the proximal phalanges of the fourth toe, 12 beneath the distal portion; scales of upper surfaces of phalanges multicarinate; the terminal phalanx is less distinctly set off from the widened portion than in the normal *Anolis*.

Dewlap very large, extending far back between the arms, with four rows of scales; its anterior edge much thickened; no enlarged postanal scales.

Dark above, limbs with darker spots; a light lateral stripe from above the insertion of the arm, gradually disappearing into the gray ground color on the flanks.

Measurements. - Snout to anus 86; tail 128+; arm 34; leg 63; tibia 21; snout to ear opening 22; width of head 12.5.

Remarks. This species is evidently distinct from the large anoles of upper Central America, such as *Anolis biporcatus* auct. and *Anolis copei* Bocourt. Dr. Hobart M. Smith, while engaged in studies on the Mexican collections in Field Museum, has checked the type of *A. barkeri* against other Mexican forms and has pointed out to me the importance of the scaling of the upper edge of the tail as a character in the genus. Of the species available to us, only *Anolis jacare* of Venezuela has a similar double row of keeled scales forming the dorsal caudal edge. The nature of the digits cannot be interpreted as in any way an approach to the genus *Norops,* in which a distinctive habitus and scutellation are combined with the simple stage of digital differentiation.

NOTES ON NOROPS

The facility with which *Norops* and *Anolis* are confused is shown by the curious synonymy of the species. Mr. Parker informs me that Boulenger's *Anolis rosenbergi* from Buenaventura, Colombia, may be added to the three synonyms of *Norops auratus* cited in the Catalogue of Lizards. Stuart (1934, p. 10) refers *Norops yucatanicus* Barbour and Cole to the synonymy of *Anolis tropidonotus.* The *Norops* of Matto Grosso and Paraguay is clearly *Norops meridionalis* Boettger, twice redescribed by Boulenger with impartiality as to generic allocation, as *Norops sladeniae* and *Anolis holotropis. Norops marmorata* Amaral, from the central Brazilian savanna region, may prove to be referable to *meridionalis* when more specimens become available. Accordingly, the species of *Norops* now known are as follows:

Norops auratus Daudin.

Anolis auratus Daudin, Hist. Nat. Rept., 4, p. 89, 1802—"Tropical America" (here restricted to Surinam).

Norops auratus Wagler, Syst. Amphib., p. 149, 1830.

Anolis rosenbergi Boulenger, Ann. Mag. Nat. Hist., (6), 17, p. 16, 1896—Buenaventura, Colombia.

Norops meridionalis Boettger.

Anolis meridionalis Boettger, Zeitschr. Naturw., Halle, 58, pp. 215, 438, 1885.

Anolis holotropis Boulenger, Ann. Mag. Nat. Hist., (6), 15, p. 522, 1895—Matto Grosso.

Norops sladeniae Boulenger, Proc. Zool. Soc. Lond., 1903, pt. 2, p. 69, fig. 2, 1903—Chapada, Matto Grosso.

Norops marmorata Amaral.

Norops marmorata Amaral, Mem. Inst. Butantan, 7, p. 63, figs. 19, 20, 1932—Jaguarão, Rio Grande, Minas Geraes.

Norops ophiolepis Cope.

Anolis (*Dracontura*) *ophiolepis* Cope, Proc. Acad. Nat. Sci. Phila., **1861**, p. 211, 1861—Monte Verde, Cuba.

Norops ophiolepis Bocourt, Miss. Sci. Mexique, Rept., pl. 16, fig. 34, 1874.

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1903. List of the Batrachians and Reptiles Collected by M. A. Roberts at Chapadá, Matto Grosso, and Presented by Mrs. Percy Sladen to the British Museum. Proc. Zool. Soc. Lond., **1903**, pt. 2, pp. 69–70, fig. 2.

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ZOOLOGICAL SERIES

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FIELD MUSEUM OF NATURAL HISTORY

Volume 24 CHICAGO, JANUARY 30, 1939 No. 3

A NEW AUSTRALIAN LIZARD
WITH A NOTE ON HEMIERGIS

BY HOBART M. SMITH[1]

In identifying a small collection of reptiles from Western Australia, purchased by Field Museum from Mr. Joseph Baldwin in 1930, I find five specimens of a new scincid lizard of the genus *Egernia*, and 11 specimens which constitute the second record of the inadequately described *Hemiergis initiale* Werner. The new *Egernia* belongs to the *striolata* group, hitherto unknown from Western Australia. I am indebted to Mr. Karl P. Schmidt for assistance in studying this Australian material, and have discussed the new species and the *Hemiergis* problem with him. We are indebted to Mr. Albert A. Enzenbacher for the pencil sketches which illustrate the new species.

Egernia carinata sp. nov.

Type from Toolbrunup,[2] Western Australia. No. 11729 Field Museum of Natural History. Collected October 30, 1930, by Joseph Baldwin.

Diagnosis. Dorsal scales tri-, quadri- and quinquecarinate, the keels rather weak, but plainly visible; 30 scales around middle of body; frontal broader and somewhat larger than interparietal; tail shorter than body or but little longer, pluricarinate, not spinose; two mid-dorsal rows of scales on basal third or half of tail; no distinct or indistinct dorsolateral light stripe; dorsal spots considerably more than half the width of a scale.

Description of type. - Head somewhat flattened; interparietal narrow, twice as long as broad, as long as frontal, not enclosed by parietals; two frontoparietals; width of frontal two-thirds its length; prefrontals in contact medially; frontonasal narrowly in contact

[1] Walter Rathbone Bacon Scholar, Smithsonian Institution.

[2] Probably near Tambellup, Southwest Division.

with rostral; four supraoculars, the second largest; frontal in contact with first two; six or seven superciliaries; lower eyelid scaly; no supranasals; a curving suture behind nostril, completely separating a postnasal on one side, terminating blindly on the other; two subequal loreals; two preoculars, the posterior less than half the size of the anterior; seven supralabials, the fifth and sixth entering the orbit; seven infralabials.

Dorsal scales on body and limbs tri-, quadri- and quinquecarinate; three pairs of pluricarinate nuchals; ear with two or three lobules; 20 or 21 lamellae under fourth toe; dorsal caudal scales pluricarinate; two mid-dorsal rows of scales on basal third of tail, replaced by a single row distad; midventral subcaudal row enlarged; tail very slightly compressed distally.

General dorsal ground color olive gray; a poorly defined, irregular black stripe extending from temporal region through upper part of ear, above arm to sides of body, there becoming indistinguishable by breaking up into small, black spots; a few scattered dark spots lower on sides of body; dorsal surface with rather indefinite rows of quadrangular spots, one on each scale row; spots in adjacent rows tending to alternate; usually a scale with a dark spot followed by an unmarked scale, then by a scale with a spot; each spot two-thirds to three-fourths the width of a scale; a few scattered spots on basal half of tail. Labia white, the scales dark-edged.

Throat and sides of belly bluish gray, the former provided with irregular flecks of darker color sometimes arranged in longitudinal series; middle of belly, posterior of limbs, and midventral surface of tail cream.

Measurements.—Snout to foreleg 33.5; foreleg 25; hind leg 34.5; snout to vent 91.5; tail 87.5; total length 179.

Notes on paratypes.—Four specimens, Nos. 11345 6 and 11730 1, with the same data as the type. Internasals narrowly in contact in one; superciliaries 6–6 in two, 6-7 in one, 7 7 in one; the partial separation of a postnasal by a curving suture, which does not reach the upper border of the nasal, appears to be the normal condition; postnasal completely separated from nasal on one side in three; seven supralabials on one side in one, supralabials otherwise eight; the sixth and seventh supralabial entering the orbit; two nuchals on one side in one, four on one side in another; auricular lobules two to four; if more than two lobules, two are much larger than others; lamellae on fourth toe 20 to 22; basal half of tail with two mid-dorsal rows of scales in two specimens.

The body and tail measurements respectively of two specimens with complete tails are: 82, 89; 91, 85.

Remarks.—The species is obviously most closely related to *striolata*, the only other *Egernia* with quinquecarinate dorsals and the tail pluricarinate and not spinose. From *striolata* the present species differs in having the frontal broader and larger than the interparietal, the posterior preocular considerably smaller than the anterior, and the two mid-dorsal series of caudal scales extending one-third the length of the tail or more (only one-fifth or one-sixth in *striolata*); in

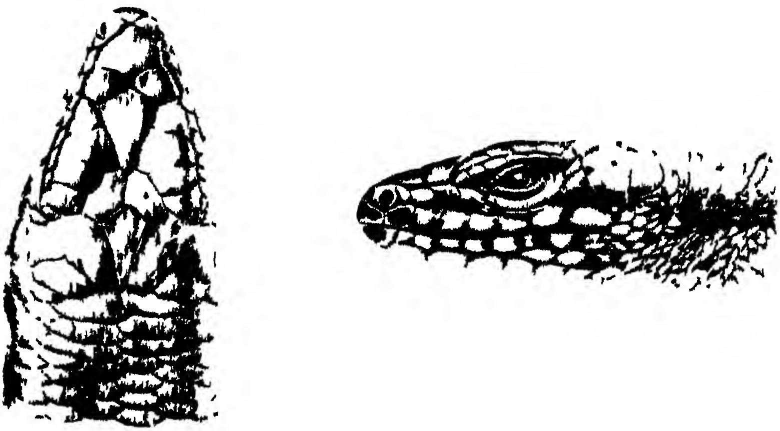

FIG. 3. Dorsal and lateral views of head of *Egernia carinata*, type, × 2.

coloration it differs by lacking a dorsolateral light line (evident in *striolata* at least on the neck) and by lacking a distinct linear arrangement of narrow, dark spots on the dorsum (in *striolata* the dorsal dark spots are narrow, occupying a third the width of a scale, and are arranged in linear series, sometimes fused). It is possible that there is an average difference in tail length, for of three specimens of *carinata* two have the tail shorter than the body, while the tail is longer than the body in three specimens of *striolata*. It is further noteworthy that *striolata* has been collected only in Queensland.

Hemiergis initiale Werner.

Hemiergis initiale Werner, Fauna Sudwest-Australiens, 2, p. 480, 1910—Lion Mill and Jarrahdale.

Eleven specimens in the same collection and from the same locality as the new *Egernia* represent *Hemiergis initiale* Werner, a species apparently known previously only from the type series. It was

tentatively considered by Loveridge (Bull. Mus. Comp. Zool., 77, p. 369, 1934) to be a synonym of *Siaphos maccoyi* Lucas and Frost. This action was no doubt prompted by the rather inadequate description of *initiale.*

In these specimens, the scale rows at the middle of the body are 20 in all, the prefrontals are well developed, the tympanum is indistinct, and the digits number five. Two indistinct series of minute spots occur on the back, one on each side of the mid-dorsal line. The sides of the body are dark gray, the color abruptly differentiated dorsolaterally from the brown dorsal color. The throat and subcaudal scales, and usually the belly scales, are dark-edged. The general tone of the subcaudal surface is much darker than that of the ventral body surface.

The distinctness of *initiale* from *maccoyi* is very clear; most pronounced is the presence of prefrontals in the former, and their absence in *Siaphos maccoyi.* It appears, moreover, that this difference is the essential generic distinction between *Siaphos* and *Hemiergis;* the number of toes does not seem a very important character, since one species (*equalis*) of the former genus has three fingers and the others five, while species of the latter genus may have two, three, four, or five. All the species of *Siaphos* lack distinct prefrontals, while all *Hemiergis* have distinct prefrontals. Loveridge's (loc. cit.) comparisons of *Siaphos equalis* and *Hemiergis decresiense* (three-fingered species) did not take into account this generic distinction, evident of course in these two species. Were the differences as slight as he states, *Hemiergis* and *Siaphos* could hardly be retained as distinct genera.

Since, however, this difference in character of the prefrontals does exist, and since, as Werner (loc. cit.) pointed out, *initiale* forms an integral part of the orthogenetic series in the evolution of *Hemiergis* toward the ultimate, most highly modified two-fingered species (*quadrilineatum*), I believe *initiale* should be retained in the genus *Hemiergis.*

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NOTES ON MEXICAN REPTILES AND AMPHIBIANS

BY HOBART M. SMITH[1]

Knowing my interest in the herpetology of Mexico, Mr. Karl P. Schmidt requested me to set in order the accumulated reptiles and amphibians from Mexico in the collections of Field Museum. I have prepared a report embodying such notes of interest and such taxonomic changes as developed in the course of work on this collection. Besides taxonomic and distributional notes, a new generic name is proposed and three new forms of lizards and one new subspecies of snake are described.

From Mexico, exclusive of Lower California, 1,931 specimens are available. These represent 236 species and subspecies, which include 9 salamanders, 28 frogs and toads, 102 lizards, 78 snakes, 2 crocodiles, and 16 turtles. In addition to specimens received in exchange, and other minor lots of material, the collection is derived in the main from the Field Museum expeditions of S. E. Meek and F. E. Lutz to central Mexico in 1901 (608 specimens), of S. E. Meek to southern and eastern Mexico in 1903 (577 specimens), of Edmund Heller and C. M. Barber in 1904 (290 specimens); and from the gift of collections made by E. Wyllys Andrews in Yucatán and Quintana Roo in 1934 and 1937 (247 specimens). The localities for the Meek collections were defined by Dr. Meek in his paper on the fresh-water fishes of Mexico (1904, pp. XXVIII–XXX).

Notes on the lizards of the genus *Cnemidophorus* are in the main reserved for a future paper. It is evident that Burt's arrangement of the Mexican forms of this genus (Burt, 1931) requires revision.

I am indebted for information regarding specimens or for other assistance to Dr. F. Angel, of the Museum d'Histoire Naturelle, Paris; to Dr. William M. Clay, Mr. D. Dwight Davis, Mrs. Helen T. Gaige, Dr. Norman Hartweg, Mr. William Stickel, Dr. Howard

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K. Gloyd, and Dr. Edward H. Taylor. The pencil sketches of the heads of the new species of *Anolis* are the work of Mr. Albert A. Enzenbacher.

The bibliographic list appended includes the papers which have been wholly or in part based on the Mexican collections in Field Museum.

Siredon mexicanum Shaw.

Gyrinus mexicanus Shaw, Nat. Misc., 9, pls. 343, 344, 1798—Mexico.
Siredon mexicanus Baird, Journ. Acad. Nat. Sci. Phila., (2), 1, p. 292, 1849.

Distrito Federal: Vicinity of Mexico City, 13 (708, J. O. Snyder, 1899; 19179, Emil Witschi, 1938; 19255, 21851, 22887–90, Gen. Biol. Supply House, 1933).

Mexico: Lake Chalco, 6 (1810), S. E. Meek, 1901.
Lerma, 1 (1383), S. E. Meek, 1903.
Texcoco, 2 (1115), S. E. Meek, 1901.

One adult (19179, transformed in captivity by Dr. Emil Witschi) is yellowish below, dark gray above; small, more or less rounded dark spots are scattered over the dorsal and ventral surfaces. In proportions it is easily distinguishable from adult *tigrinum;* the head is broader than long (20×22), the body short and stout (snout to vent 89), the limbs long and powerful (foreleg 28; hind leg 32).

The larvae are distinguishable from those of *tigrinum* by color pattern. In *mexicanum,* small, more or less rounded, indefinitely outlined black spots are scattered over the dorsal and usually the ventral surfaces, while in *tigrinum* these spots are absent, the larvae more or less unicolor and pale.

Two young larvae (snout to vent 51 and 74) from Texcoco (1115) lack the spots on the belly, and the general ground color is rather pale. The assumption is that the larvae become progressively darker as they grow larger and older.

A large larva from Lerma (1383) may represent a form distinct from that which occurs about Mexico City. Although the ground color is dark in this specimen, as in typical *mexicanum,* the small black spots characteristic of other specimens are lacking. The region in which this specimen was collected is more or less isolated by mountain ranges from the valley of Mexico, from which the other specimens came.

Siredon Wagler (Syst. Amph., pp. 209, 210, 1830; type *axolotl*=*mexicanum*) has priority over *Ambystoma* Tschudi (Mem. Soc. Sci. Nat. Neuchatel, **2**, p. 92, 1838; type *subviolacea*=*maculatum*). To

throw all species now referred to *Ambystoma* into the genus *Siredon* would add tremendously to the taxonomic confusion already caused in the group. In avoidance of this procedure, one of two alternatives may be chosen: either officially to discard *Siredon* through action of the International Commission on Zoological Nomenclature, or to restrict the genus, if possible. The latter course seems to be the more satisfactory, for the genus can be restricted to two species, *mexicanum* and *dumerilii*, which normally never transform. *Ambystoma* redefined therefore excludes these two species, and includes only forms which normally transform into the adult land stage.[1]

Siredon dumerilii Dugès.

Siredon dumerilii Dugès, La Naturaleza, 1, pp. 241–244, pl. 5, 1870—Lake Pátzcuaro, Michoacán.

Michoacán: Pátzcuaro, 4 (958), S. E. Meek, 1901.

The extensive webbing of the digits readily distinguishes larvae of this species from those of *mexicanum* and *tigrinum*. Dunn (Anat. Rec., **51**, Suppl., p. 90, 1931) states that they never transform.

The description usually quoted as the original (Ann. Sci. Nat. Paris, (5), **15**, No. 17, pp. 1, 2, pl. 10, figs. 1–13) was actually published in 1872, two years after the description which appeared in *La Naturaleza.*

Chrysemys picta bellii Gray.

Emys bellii Gray, Syn. Rept., p. 31, 1831—type locality unknown.

Chrysemys picta bellii Bishop and Schmidt, Field Mus. Nat. Hist., Zool. Ser., 18, p. 136, 1931.

Chihuahua: Rio Santa Maria, 1 (2440), C. M. Barber, 1902.

This specimen represents the only record of the occurrence of the genus in Mexico. It is a young specimen, the carapace measuring 31 mm. in length. The color pattern of the carapace and plastron is typical.

Terrapene mexicana yucatana Boulenger.

Cistudo yucatana Boulenger, Ann. Mag. Nat. Hist., (6), 15, p. 330, 1895—northern Yucatán.

Quintana Roo: Cobá, 2 (27272–3), E. Wyllys Andrews, 1937.

Yucatán: Chichen Itzá, 1 (27271), E. Wyllys Andrews, 1937.

All agree in having a distinct median keel, a notched jaw, a poorly developed digital web, and four toes. There is no indication

[1] It is my understanding, from conversation with Mr. Schmidt, that this is the solution of the problem preferred by Dr. E. R. Dunn.

of a radial pattern on the carapace; in the Cobá specimens the carapace is nearly uniform straw yellow, with some slight darkening along the sutures, while the Chichen Itzá specimen is largely dark above, mottled with large, irregular, lighter areas. The plastron is dark in all, with irregular, less extensive light areas. The head and forelimbs are very pale yellow in the Cobá specimens. The carpal formula for the Chichen Itzá specimen is 2–3–3–3–2. It lacks a zygomatic arch.

The discussion by Lorenz Müller (Zool. Anz., **113**, pp. 97–114, 1936) of the variation in a series of 29 specimens of *Terrapene* from the vicinity of Tampico, Tamaulipas, is of much importance in arriving at an understanding of the Mexican species. I do not, however, agree with his conclusion that *yucatana*, *goldmani*, *nelsoni*, and *mexicana* are all one and the same. On the basis of data available at present, I would modify his conclusions as follows:

(1) That *goldmani* and *mexicana* are synonymous.

(2) That *nelsoni* is a distinct species characterized by having four claws on the hind feet and a very flattened carapace (see Ditmars, Zoologica, **17**, figs. 31–33; these illustrations apparently were not available to Müller).

(3) That *yucatana* is distinguishable from *mexicana* at least on the basis of average number of toes.

Five specimens recorded from Yucatan all have four claws on the hind feet, while of 32 specimens of *mexicana* recorded from mainland Mexico, only six are four-clawed. Combined with the fact of geographic discontinuity, this appears to be of taxonomic significance. The measurements of our three specimens are as follows:

	27273	27272	27271
Length of carapace	151	86	153
Width of carapace	112.5	74	112
Length of plastron	149	84.5	147
Width of plastron	85	53	87
Median gular suture	19	13	20
Median humeral suture	22	12	22
Median anal suture	41	23	45
Anterior plastral lobe	58	33	57
Height	73	44	..

Terrapene ornata Agassiz.

Cistudo ornata Agassiz, Contr. Nat. Hist. U. S., 1, p. 445, 1857—the upper Missouri River and Iowa.

Terrapene ornata Baur, Science, 17, p. 191, 1891.

Chihuahua: south of Lake Santa María, 2 (2002), C. S. Brimley, 1902.

In one specimen the length of the carapace is 127; width at the eighth marginal 108; length of plastron 132; width at femoral plates 78.5. In the other, the length of the carapace is 124, its width 112; length of plastron 125, width 79.

Platypeltis emoryi Agassiz.

Aspidonectes emoryi Agassiz, Contr. Nat. Hist. U. S., **1**, p. 407; **2**, pl. 6, figs. 4, 5, 1857—Rio Grande River, near Brownsville, Texas.

Platypeltis emoryi Baur, Proc. Amer. Phil. Soc., **31**, p. 220, 1893.

Nuevo León: Rodriguez, 2 (1874, 2191), S. E. Meek, 1900 and 1906.

It appears that Malcolm Smith (Bull. Raffles Mus., **3**, p. 2, 1930) is correct in concluding that Geoffroy St. Hilaire definitely indicated the type of *Trionyx* as *aegypticus* (=*triunguis*) (Ann. Mus. Hist. Nat. Paris, **14**, pp. 4, 5, 20, 1809). It further appears that the soft-shelled turtles of the Old World and the New World are generically distinct, the former having eight costal shields, the latter seven. Since *Trionyx* has as its type an Old World species, the next available name for a New World species is *Platypeltis* Fitzinger (Ann. Wien Mus., **1**, p. 127, 1836), whose type species is *ferox* Schneider.

Anolis cozumelae sp. nov. Figure 4.

Type from Cozumel Island, Yucatán. No. 751 Field Museum of Natural History. Male. Collected April, 1899, by C. F. Millspaugh.

Diagnosis.—No dorsal crest on body; tail with a high crest two-thirds as high as the rest of the tail; no conspicuous projecting mid-dorsal scales on caudal crest at the whorls; ventrals smooth, about twice as large as largest dorsals; two mid-dorsal rows of scales distinctly larger than adjacent dorsals, which are but slightly larger than laterals; head scales nearly smooth; about 10 enlarged supra-oculars; supraorbital semicircles narrowly in contact medially and separated from occipital by three rows of scales.

Description of type.—Dorsal head scales rugose, smooth or very weakly keeled; frontal ridges weak, divergent, enclosing a very slight depression; five scales bordering rostral between supralabials; five canthal scales, prominently keeled; five rows of loreals; six supra-labials to a point below middle of eye; about 10 enlarged supraoculars separated from supraorbital semicircles by one or two (usually two) rows of granules, from superciliaries by three; supraorbital semi-circles narrowly in contact medially, separated from occipital by two rows of scales; occipital somewhat smaller than ear opening;

occipital area enclosed posteriorly by two conspicuous, convergent ridges arising at posterior margin of orbit.

Dorsal scales keeled, the two median rows slightly larger than the adjacent scales, which gradually merge with the slightly smaller lateral scales; ventral scales, including those of dewlap, absolutely smooth, about twice as large as largest dorsals; scales of throat keeled.

Scales on anterior surfaces of thigh and lower foreleg subequal, two or three times as large as ventrals on body, keeled; 20 lamellae on the second and third phalanges of fourth toe.

Tail strongly compressed, with a mid-dorsal crest whose greatest proportional height is about two-thirds the diameter of the body of the tail, extending about two-thirds the length of the tail, absent on the distal third; four or five mid-dorsal scales between whorls; subcaudal scales much larger than lateral caudal scales.

Color.—The specimen is somewhat discolored as a result of many years of preservation. The general dorsal tone is light brown; ventral surfaces lighter; limbs banded, the toes very distinctly; dewlap dark (purple?) anteriorly, fading posteriorly; sides of head light; temporal region mottled with dark and light brown.

Measurements.—Snout-vent length 64; tail (broken) 80; hind leg 52; tibia 16; snout to ear 17; head width 13.

Remarks.—The only species of *Anolis* with a caudal crest heretofore recorded from Mexico is *sagrei*, a species known also from the West Indies and characterized by having keeled ventral scales, strong, nearly parallel frontal ridges, strongly keeled head scales, and one row of small scales between supraorbital semicircles.

The present specimen thus differs markedly from *sagrei*, which has been recorded from Cozumel Island (Cope, Bull. U. S. Nat. Mus., **32**, p. 32, 1885), and I find it impossible to allocate it to any other compressed-tailed species from the West Indies or Central America.

Anolis laeviventris Wiegmann.

Anolis laeviventris Wiegmann, Herp. Mex., p. 47, 1834—Mexico.

Vera Cruz: Xico, 1 (1345), S. E. Meek, 1903.

The specimen differs from *sericeus* in lacking a central purple spot in the dewlap, in having enlarged postanals, and in having distinctly smaller dorsals and ventrals; it differs from *nebulosus* and *nebuloides* in having smaller ventrals and the supraoculars in two series. The dorsal scales are keeled, the two median rows the largest, gradually decreasing in size laterally. Snout-vent length 37; tail broken; snout to ear 9; tibia 6.7; head width 7.

The supraorbital semicircles are in contact; frontal ridges nearly obsolete; scales on snout rugose, some unicarinate; supraoculars faintly keeled; two rows of scales between occipital and supraorbital semicircles; occipital less than twice greatest diameter of ear; 14 lamellae under third and fourth phalanges of fourth toe.

Anolis nebuloides Bocourt.

Anolis nebuloides Bocourt, Miss. Sci. Mex., Rept., p. 74, pl. 13, fig. 10, 1873—Putla, Oaxaca.[1]

Oaxaca: Cuicatlan, 1 (990), S. E. Meek, 1901.
Oaxaca, 1 (989), S. E. Meek, 1901.
San Gerónimo, 1 (1475), Heller and Barber, 1904.

These specimens are differentiated from those referred to *nebulosus* solely on the basis of relative size of the dorsal and ventral scales; in the southern specimens the difference in relative size of dorsal and ventral scales is perceptibly greater than in the northern specimens. The presumed differences in carination and in character of the supraorbital semicircles do not hold.

Anolis schmidti sp. nov. Figure 4.

Type from Manzanillo, Colima. No. 1667 Field Museum of Natural History. Male. Collected by C. H. T. Townsend, 1903.

Diagnosis.—A small *Anolis*, with a single row of large supraoculars narrowly in contact with supraorbital semicircles; semicircles in contact, separated from occipital by a single row of scales; occipital much larger than ear opening; dorsals small, distinctly keeled, gradually becoming smaller laterally; ventrals not distinctly larger than dorsals, curiously protuberant (not flat), weakly keeled; postanals distinctly enlarged.

Description of type. All dorsal head scales smooth, except a few unicarinate scales in internasal region; frontal ridges distinct, diverging anteriorly, enclosing a distinct, depressed, prefrontal area; occipital large, much larger than ear opening, separated by a single row of small, flat scales from supraorbital semicircles; latter composed of rather large scales, broadly in contact medially, separated by three scales at their point of termination at the canthus; two or three very large supraoculars, their width about three-fourths the width of the supraorbital area; supraoculars narrowly in contact with supraorbital semicircles, separated from superciliaries by one

[1] The "Putla, Mexico" of many specimens in the British Museum is apparently the Putla in Oaxaca, located near the Guerrero-Oaxaca border at approximately 17° N. and 98° W.

or two rows of granules; three postrostrals between nasals, followed posteriorly by a transverse row of four scales; four canthals, weakly keeled; first superciliary nearly two-thirds length of orbit; five rows of loreals; subocular series in contact with supralabials; seven supralabials and eight infralabials to a point below middle of eye.

All gular scales smooth, convex; dorsal scales rather small, five or six times as large as the granular laterals, gradually decreasing in size laterally, distinctly keeled; ventral scales about the same size as the largest dorsals, not flat but somewhat conical and projecting, weakly keeled, pointed.

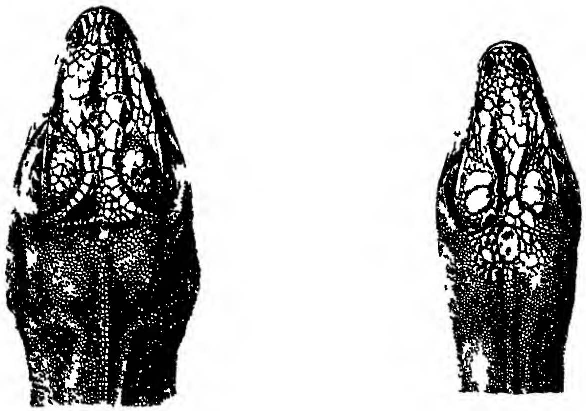

FIG. 4. *Anolis cozumelae* (at left), $\times 1\frac{1}{2}$. *Anolis schmidti* (at right), $\times 2$.

Four rows of enlarged, keeled scales on anterior surface of lower foreleg; six rows of slightly larger, keeled scales on anterior surface of thigh; ventral shank scales keeled; 15 lamellae under the third and fourth phalanges of the fourth toe; postanals distinctly enlarged; tail rounded; mid-dorsal row of tail scales slightly larger than adjacent scales.

Color.—Pale yellow above and below; a conspicuous, yellow, dark-edged spot on dorsal posterior surface of shank; fingers and toes faintly barred; dewlap apparently yellow.

Measurements.—Snout-vent length 45; tail broken; snout to ear 12; width of head 7; hind leg 33; tibia 9.7.

Remarks.—This species is distinctly different from *nebulosus* and *nebuloides* in the character of the ventral scales. Its nearest relative may be *utowanae*, which differs in having flat, pavement-like ventral

scales, three to five series of scales between occipital and supraorbital semicircles, occipital smaller than ear opening, only three rows of loreals, and in other characters.

Ctenosaura pectinata Wiegmann.

Cyclura pectinata Wiegmann, Herp. Mex., p. 42, pl. 2, 1834—Colima, Colima.
Ctenosaura pectinata Boulenger, Cat. Liz. Brit. Mus., 2, p. 197, 1885.

Colima: Manzanillo, 1 (1640), C. H. T. Townsend, 1903.
Paso del Rio, 1 (1674), Emerick, 1904.

Guerrero: Balsas, 3 (1725), S. E. Meek, 1901.
Laguna Coyuca, 1 (25882), Walter Mosauer, 1935.

Morelos: Puente de Ixtla, 2 (1094), S. E. Meek.
Yautepec, 1 (1349a), S. E. Meek, 1903.

Oaxaca: San Gerónimo, 1 (1455), Heller and Barber, 1904.

Sinaloa: Mazatlán, 1 (442).

The west coast *Ctenosaura* seem to be in some confusion despite recent work. Specimens in the above series are not consistent in their characters: two of them (1455, 1094a) have the caudal whorls as in *acanthura,* but neither has the dorsal crest interrupted in the sacral region as it normally is in that species; four (1640, 1094, 1725a) have the dorsal crest interrupted at the sacrum; in the others it is complete.

Phrynosoma orbiculare cortezii Bocourt.

Tapaya cortezii Duméril and Bocourt, Miss. Sci. Mex., Rept., pl. 11, fig. 2, 1870—Hacienda del Jasmin, between Orizaba and Cordova, Vera Cruz.
Phrynosoma orbiculare cortezii Smith, Trans. Kans. Acad. Sci., 37, p. 291, 1935.

Puebla: Atzitzintla, 3 (1515), Heller and Barber, 1904.

The form is very easily distinguished from the typical subspecies by the lesser length of the occipital spines (shorter than temporals). It is notable that *o. cortezii* has a broken, midventral longitudinal dark line, while *o. orbiculare* lacks it.

Uta irregularis Fischer.

Phymatolepis irregularis Fischer, Abh. Nat. Ver. Brem., 7, p. 232, pl. 17, figs. 1–4, 1882—Mexico.
Uta irregularis Boulenger, Cat. Liz. Brit. Mus., 2, p. 216, 1885.

Guerrero: Laguna Coyuca, near Acapulco, 1 specimen (25884), Walter Mosauer, 1935.

A broken, irregular series of small scales separates the two series of larger scales at irregular intervals. Femoral pores 8–9 (lower than in *bicarinata* and its very close relatives, *tuberculata* and *nelsoni*). The species differs from other Mexican species of the group (except

perhaps *gadovi*, which I have not seen) in having the blue belly patches of the male distinctly outlined and restricted to two small, oval areas on the chest, narrowly separated medially. The ventral scales are feebly mucronate, but not keeled even on the chest (where keeling is most prominent in *bicarinata* and its allies).

Gaigeia gen. nov.

Type.—*Lepidophyma gaigeae* Mosauer, Herpetologica, 1, pp. 3–5, pl. 2, 1936.

Diagnosis.—Dorsal lepidosis nearly uniform; caudal scales uniform; no supraoculars; two frontals with a longitudinal median suture; normally no prefrontal; no infralabials (chin-shields bordering labium); a well-differentiated postocular; ventrals flat.

Remarks.—The genus differs from the monotypic *Lepidophyma* in the following characters (opposing characters of *Lepidophyma* in parentheses): dorsal lepidosis nearly uniform (heterogeneous); no differentiated tail whorls (present); ventral scales smooth, flat (keeled, convex); normally no median prefrontal (normally present). In all these characters, except the last, *Gaigeia* resembles *Xantusia*, a genus which it superficially resembles much more than *Lepidophyma*. It differs from *Xantusia* in the following characters (opposing characters of *Xantusia* in parentheses): no supraoculars (present); no infralabials (present); a well-differentiated postocular (absent; scales in this region granular); normally no median prefrontal (present). Again, in all these characters, except the last, *Gaigeia* resembles *Lepidophyma*. It appears obvious that it stands in a position intermediate between *Lepidophyma* and *Xantusia*, combining their characters. The normal absence of the median prefrontal is unique.

The erection of a monotypic genus for *Lepidophyma gaigeae* will not, I believe, obscure its relationships; on the contrary, it appears to clarify them, for the species in question is no more closely related to *Lepidophyma flavomaculatum* than to *Xantusia*.

The three continental genera of the family *Xantusiidae* are ecologically as well as geographically isolated: *Xantusia* in low, arid or semi-arid regions; *Gaigeia* in high mountains at the coniferous belt; and *Lepidophyma* in moist, tropical lowlands.

One paratype of *Gaigeia gaigeae* is in Field Museum.

Cnemidophorus angusticeps Cope.

Cnemidophorus angusticeps Cope, Proc. Amer. Phil. Soc., 17, p. 95, 1877—Yucatán.

Quintana Roo: Cobá, 2 (27311–2), E. Wyllys Andrews, 1937.

Yucatán: Chichen Itzá, 9 (27313–21), E. Wyllys Andrews, 1937.

Since this form occupies an isolated area in which there is little topographic variation, it appears to have become quite well differentiated. It is characterized by having six distinct, unbroken white lines in the young and old of both sexes; sometimes, in the adults or young, an additional median, poorly outlined light stripe is present. The tail and hind limbs are pink and the latter light-spotted; the pink suffusion is especially pronounced on the tail and is more evident in females than in males.

The belly of males is suffused with blue, the gular region pinkish. The postantebrachials are reduced, not granular, but not greatly enlarged. The femoral pores vary between 18 and 23, average 20 (18, one; 19, seven; 20, seven; 21, four; 22, one; 23, one).

Cnemidophorus deppii deppii Wiegmann.

Cnemidophorus deppii Wiegmann, Herp. Mex., p. 28, 1834—Mexico; restricted by Hartweg and Oliver (vide infra) to Tehuantepec, Oaxaca.

Cnemidophorus deppii deppii Hartweg and Oliver, Occ. Papers Mus. Zool. Univ. Mich., 359, pp. 1–3, 1937.

Oaxaca: San Gerónimo, 9 (1473), Heller and Barber, 1904.

These specimens seem typical of *deppii deppii*, having 18 to 21 femoral pores, 4 to 6 scales from snout to ventral scales, and 2 to 5 interorbital scales (one exceptional specimen with 7–8 interorbitals).

Cnemidophorus deppii lineatissimus Cope.

Cnemidophorus lineatissimus Cope, Proc. Amer. Phil. Soc., 17, p. 94, 1877—Colima and Guadalajara.

Cnemidophorus deppii lineatissimus Van Denburgh, Occ. Papers Calif. Acad. Sci., 5, p. 463, 1897.

Guerrero: Balsas, 8 (1015), S. E. Meek, 1901.

These specimens are referred to *d. lineatissimus* with some doubt, as no adult males are present in the series. Scale counts indicate, however, a greater affinity for this subspecies than for typical *d. deppii*. The scales between the anus and ventral scutes average 7 (6, four; 7, one; 8, two); femoral pores 14 to 21, average 17 (14, two; 15, two; 16, one; 17, three; 18, four; 20, one; 21, one); interorbital scales (counting from posterior extension of superciliaries forward to the termination of the series) average 7 (3, one; 4, one; 5, two; 6, five; 7, two; 8, one; 9, two; 10, two); usually two complete or incomplete rows of granules between supraoculars and superciliaries (one exception). In all these characters except the last the specimens approach

d. lineatissimus more closely than *d. deppii;* the reverse is true of the last character.

One other character may be more or less typical of *d. lineatissimus:* the contact of the posterior preocular and the loreal. If so, the Balsas specimens are intermediate, for this condition occurs on both sides of only five specimens and on one side of one. In 29 specimens of *d. deppii*, the condition mentioned occurs on both sides in only four, on one side in three.

Cnemidophorus deppii oligoporus subsp. nov.

Type from Perez, Vera Cruz. No. 29145 Field Museum of Natural History. Male. Collected by Julius Friesser in 1903. Paratypes ten, including three topotypes (1683, Julius Friesser, 1903), three from Otopa, Vera Cruz (1313, S. E. Meek, 1903), and four from Vera Cruz, Vera Cruz (1343, S. E. Meek, 1903).

Diagnosis.—A form closely related to *deppii deppii*, differing from that form in average number of femoral pores (16) and in average number of scales from the anus to the ventral scutes; from *deppii lineatissimus* it differs in coloration and in having the posterior preocular usually separated from the loreal.

Description of type.—Three supraoculars; row of granules between oculars and median head scales short, not extending to suture between second and third supraoculars, consisting of 6 or 7 scales (counting forward from the posterior extension of the superciliaries, following the row of largest scales); median gular scales not imbricate; mesoptychial scales somewhat larger than median gular scales, imbricate.

Femoral pores 15–16; scales between anus and ventral scutes number 6.

Eight dorsal light lines, the lateral pair on each side faintly interrupted. Entire ventral surfaces of head, body, thighs, and upper forelegs black.

Measurements.—Snout to vent 68; tail 131.

Remarks.—The most important character for separation of this from the typical form is the number of femoral pores. In seventeen counts of *d. oligoporus*, the average is 16.4, and 82.4 per cent of the counts are 17 or less. In 188 counts of *d. deppii* (specimens from San Gerónimo, Oaxaca; El Rancho, Guatemala; Divisadero, El Salvador; west of San Pedro, Pespire, and San Lorenzo, Honduras) the range is from 16 to 24, the average 19.4, and only 5.9 per cent of the counts are 17 or less.

A second differential character is the number of scales between the anus and ventral scutes. In eight counts of *d. oligoporus*, this number varies between 6 and 8, the average is 6.9, and 100 per cent of the counts are 6 or more. In 99 counts of *d. deppii*, the range is from 4 to 7, the average is 5, and 17.2 per cent of the counts are 6 or more.

The form differs from *d. cozumelae* in the absence of an accessory scute on each side between the interparietal and parietal. From *d. lineatissimus* it differs in ventral coloration of the male (nearly entirely black in *deppii oligoporus*, as in *d. deppii*) and perhaps in the usual separation of the posterior preocular from the loreal (usually not in *d. lineatissimus*).

Cnemidophorus octolineatus Baird.

Cnemidophorus octolineatus Baird, Proc. Acad. Nat. Sci. Phila., 1858, p. 255, 1858—Pesquieria Grande, Nuevo León.

Coahuila: Jaral, 4 (1671), Heller and Barber, 1904.

It appears necessary to employ this name for these specimens, which probably represent a widely distributed form. These are young (maximum snout-vent measurement 56), with eight longitudinal, unbroken light lines, and no spots in the dark fields; the scales on the posterior surface of the lower foreleg are uniformly granular, and the mesoptychial scales small.

In the youngest specimen the median pair of light lines is distinct, many being well separated, but closer to each other than to the adjacent stripes; in larger specimens the median pair tend to fuse together.

The specimens obviously belong to the *tessellatus* group, but differ from *grahamiae*, the only form of that group at present recognized in western Texas and the adjacent area which might be considered conspecific with these specimens, by having a pair of stripes on the mid-dorsal region in the young, instead of one median stripe.

Leptotyphlops maximus Loveridge.

Leptotyphlops maximus Loveridge, Proc. Biol. Soc. Wash., 45, pp. 151, 152, 1932 —Chilpancingo, Guerrero.

Guerrero: Balsas, 1 (1263), S. E. Meek, 1901.

Scale rows 14; 224 scales from rostral to tip of tail; 16 subcaudals; total length 168; tail length 9. One supralabial between ocular and nasal, reaching nearly to level of eye, more than twice as deep as broad; nasals in contact medially behind rostral; three infralabials. Seven dorsal rows are stippled with darker color, the ventral rows

white, the dorsal and ventral colors sharply defined laterally. The specimen differs from others of the species particularly in having the nasals in contact behind the rostral.

Leptotyphlops phenops Cope.

Stenostoma phenops Cope, Journ. Acad. Nat. Sci. Phila., (2), 8, p. 128, 1876—Tehuantepec.

Leptotyphlops albifrons Schmidt and Andrews, Field Mus. Nat. Hist., Zool. Ser., **20**, pp. 168, 169, 1936.

Yucatán: Chichen Itzá, 4 (20606, 20616–8), E. Wyllys Andrews, 1934.

Scales from rostral to tip of tail, 254, 250, 235, 238, respectively; caudals 18, 19, 25, 22; total length 157, 161, 130, 85; tail length 9, 9, 10, 6.5.

The species is distinct from *albifrons*, with which it has been confused. The Mexican records should be referred to this species or to *bakewelli*. *L. albifrons* has less than 200 dorsals, the head scales are very prominently pitted, the pupil of the eye is invisible (very distinct in *phenops*), the light spot on the head extends over several scales adjacent to the rostral (confined to the rostral in *phenops*), the terminal caudal light spot is equally extensive dorsally and ventrally (mostly confined to ventral surface in *phenops*), and there are various other differences between the two species in the shape of the head and of the head scales.

Geophis dugesii Bocourt.

Geophis dugesii Bocourt, Miss. Sci. Mex., Rept., p. 573, pl. 37, fig. 1, 1883—Tangancícuaro, Michoacán.

Michoacán: 1 (30965), Stanford University.

Female; ventrals 164; caudals 39; supralabials 5–5; infralabials 5–6; oculars 0–1; temporals 1–2, 1–1; total length 179; tail 27.

Bluish black above; an indistinct light band across nape, and two on anterior part of body, enclosing between them two long, oval, uniform black patches; scales on sides with light centers, the size of the light spots increasing ventrally and decreasing posteriorly; upper lip white; chin-shield region stippled with black; belly uniform white; some black stippling present along the sutures of the posterior subcaudals.

A male specimen (Stanford University 4408) agrees in coloration; ventrals 150; caudals 43. The teeth of the lower jaw are 11 or 12, slightly decreasing in size posteriorly; maxilla extending slightly anterior to suture between first and second supralabials; palatine

extending to suture between second and third infralabials; 10 maxillary teeth, subequal, not grooved.

Hemipenis single; sulcus spermaticus forked at a point two-thirds the distance from the base of the organ; distal third papillate, grading into a median third which is provided with heavy spines situated on longitudinal ridges; proximal third smooth, ridged.

These two specimens differ from the description of *dugesii* in two respects: color (*dugesii* with six or seven well-defined, yellowish half rings on anterior half of body) and number of ventrals (176 in the description). Dugès (La Naturaleza, 6, p. 360, 1884) threw doubt upon the correctness of the ventral count, stating that he had counted 156 ventrals before he sent the specimen to Bocourt. The latter number compares well with those of the present specimens of *dugesii*, while the count given by Bocourt is considerably beyond the expected range of variation in one sex of this species. Dr. F. Angel has kindly examined the type at my request and verified Dugès' count. With this information available I have no hesitation in referring these specimens to *dugesii*.

Natrix rhombifera blanchardi Clay.

Natrix rhombifera blanchardi Clay, Ann. Carnegie Mus., **27**, p. 251, pl. 25, 1938—near Tampico, Tamaulipas.

Nuevo León: Montemorelos, 1 (1389, paratype), S. E. Meek, 1903.

Tamaulipas: Garza Valdez, 1 (2079, paratype), S. E. Meek, 1901.

Vera Cruz: La Antigua, 1 (2039), S. E. Meek, 1901.

The Vera Cruz specimen is not included in *blanchardi* by Clay; it seems best to associate it here until further specimens throw light on the question thus raised.

Eudryas boddaertii melanolomus Cope.

Masticophis melanolomus Cope, Proc. Acad. Nat. Sci. Phila., **1868**, p. 105, 1868—Yucatán.

Eudryas boddaertii melanolomus Stuart, Occ. Papers Mus. Zool. Univ. Mich., **254**, p. 2, 1933; Schmidt and Andrews, Field Mus. Nat. Hist., Zool. Ser., **20**, p. 172, 1936.

Yucatán: Mérida, 2 (19426, Eunice Blackburn, 1934; 20627, E. Wyllys Andrews, 1934).

These specimens are discussed by Schmidt and Andrews (loc. cit.).

Thamnophis macrostemma macrostemma Kennicott.

Eutaenia macrostemma Kennicott, Proc. Acad. Nat. Sci. Phila., **1860**, p. 331, 1860—Mexico City.

Mexico: Chalco, 23 (1097, 1098, 1265, 1279, 2037), S. E. Meek, 1901 and 1903.
Lerma, 1 (1299), S. E. Meek, 1903.

Michoácan: Pátzcuaro, 9 (1101, 1396), S. E. Meek, 1901.

Puebla: Puebla, 11 (1320), S. E. Meek, 1903.

The subspecies is separated from *m. megalops* largely on the basis of caudal counts. In caudal counts of males, 95 per cent of *m. macrostemma* have 78 or less, while 93 per cent of *m. megalops* have 79 or more; in females there is no overlap. In ventral count of females, 71 per cent of *m. macrostemma* have 158 or less, while 70 per cent of *m. megalops* have 159 or more; the overlap in males is complete. In total counts, of males, 95 per cent of *m. macrostemma* have 242 or less, while 93 per cent of *m. megalops* have 243 or more; in females of *m. macrostemma*, 80 per cent have 221 or less, while in *m. megalops*, 100 per cent have 222 or more.

Kennicott's description of *megalops* precedes the description of *macrostemma* by one page; Ruthven (Bull. U. S. Nat. Mus., **61**, p. 44, 1908), probably for this reason, chose *megalops* for the specific name, placing *macrostemma* in its synonymy. This cannot stand, however, for Ruthven was not the first reviser. Cope had selected *macrostemma* many years before (Proc. Acad. Nat. Sci. Phila., **1866**, p. 306, 1866). In this paper specimens are listed from Fort Whipple, Arizona, under the name *Eutaenia macrostemma;* the name *megalops* does not appear, although a key to certain forms of the genus is included. I infer that Cope considered the two presumed species synonymous, and that he selected *macrostemma* to represent the species. This is supported by Cope's subsequent treatment of *macrostemma* (Bull. U. S. Nat. Mus., **1**, p. 41, 1875), "*Eutaenia macrostemma* Kennicott, subspecies *megalops* Kennicott. . . ." Thus, if *macrostemma* and *megalops* are identical, or are allied as subspecies, the species should be known as *Thamnophis macrostemma* Kennicott.

Thamnophis macrostemma megalops Kennicott.

Eutaenia megalops Kennicott, Proc. Acad. Nat. Sci. Phila., **1860**, p. 330, 1860—Tucson and Santa Magdalena, Arizona.

Chihuahua: Chihuahua, 1 (1266), S. E. Meek, 1901.
Colonia Juárez, 15 (1100, 1267, 1268), S. E. Meek, 1901.
Jiménez, 3 (1270), S. E. Meek, 1901.
Miñaca, 3 (1273), S. E. Meek, 1901.
San Andrés, 3 (1275), S. E. Meek, 1901.

Durango: Coyotes, 7 (1503), Heller and Barber, 1904.
Durango, 1 (1385), S. E. Meek, 1903.
Lerdo, 1 (1400), S. E. Meek, 1903.
Jalisco: Ocotlán, 1 (1274), S. E. Meek, 1901.

VARIATION IN SCALE COUNTS OF THAMNOPHIS MACROSTEMMA

	Sex	Caudals			Ventrals			Total Ventral Count		
		No. spec.	Range	Average	No. spec.	Range	Average	No. spec.	Range	Average
m. megalops	♂	14	78–89	83	15	159–169	165	14	242–255	249
	♀	14	69–89	75	17	149–161	156	14	222–260	236
m. macrostemma	♂	20	65–79	73	27	159–169	164	20	226–244	236
	♀	10	63–67	65	20	152–171	161	10	214–228	220

Conophis concolor Cope.

Conophis concolor Cope, Proc. Acad. Nat. Sci. Phila., **1866**, p. 318, 1866—Mexico; Schmidt and Andrews, Field Mus. Nat. Hist., Zool. Ser., **20**, p. 178, 1936; Andrews, l.c., p. 358, 1937.

Yucatán: Chichen Itzá, 4 (20610-1, 26986-7), E. Wyllys Andrews, 1934 and 1937.
Mérida, 2 (19411, 19413), Eunice Blackburn, 1934.

The two specimens (26986-7) whose scutellation has not been previously recorded have 19-19-17 scale rows; ventrals 160, 168, respectively; caudals 67+, 69; supralabials 8-8; infralabials 10-10, 9-9; oculars 1-2; total length of 26986 (the largest, with tail incomplete) 938+, tail length 191+.

Conophis viduus Cope.

Conophis viduus Cope, Journ. Acad. Nat. Sci. Phila., (2), 8, p. 137, 1876—Tehuantepec.

Oaxaca: San Gerónimo, 1 (1457), Heller and Barber, 1904.

Male; scale rows 19-19-17; ventrals 160; caudals 74; supralabials 7-7; infralabials 9 10; oculars 1-2; temporals 2-2-3; total length 504; tail 121.

The stripes on the body are brown, not black as in *vittatus;* the lateral pair involves the second, third, and fourth scale rows, while the median row involves the eighth, ninth, tenth, ninth, and eighth rows; the lateral edges of the median dark stripe are black.

Conophis vittatus Peters.

Conophis vittatus Peters, Monatsber. Akad. Wiss. Berl., **1860**, pp. 519, 520, pl., fig. 3, 1860— type locality unknown, restricted to Acapulco, Guerrero.

Conophis sumichrasti Cope, Journ. Acad. Nat. Sci. Phila., (2), 8, p. 137, 1876—Tehuantepec and Guadalajara, restricted to Tehuantepec (city).

Guerrero: Laguna Coyuca, near Acapulco, 1 (25881), Walter Mosauer, 1935.

Male; scale rows 19–19-17; ventrals 156; caudals 65; supralabials 7-7; infralabials 8–9; oculars 1–2; temporals 2-2-3; total length 514; tail length 110.

There are four distinct, black stripes on the body, the lateral pair involving the third and fourth scale rows, and the medial pair involving the eighth and ninth rows; a median dorsal light stripe, occupying the median scale row and half of the adjacent scale rows over most of the body, extends from the neck to the tail.

Conopsis nasus Günther.

Conopsis nasus Gunther, Cat. Snakes Brit. Mus., p. 6, 1858—Mexico.

Mexico: Chalco, 2 (987a-b), S. E. Meek, 1901.

Vera Cruz: Orizaba, 1 (1462), Heller and Barber, 1904.

The two from Chalco are males, the one from Orizaba a female; all have 17 scale rows throughout; ventrals 117, 118, 131, respectively; caudals 37, 38, 30; supralabials 7–7, 7–7, 6–6; infralabials 8–8, 7–8, 6–7; oculars 1–2 in all; temporals 1–1–3 on one side of 987a, 1–2–3 in others; total length 215, 182, 177; tail length 42.5, 34, 27. In the two males the loreal is absent, while in the female it is present; in 987a the preocular and nasal are in contact, while in 987b the prefrontal separates them; in 987a the frontal is in contact with the internasals; the nasal is entire in all. The two posterior maxillary teeth of 1462 are grooved.

A broken, median dark stripe one scale row wide is present, and a faint lateral stripe occurs on rows 3 and 4, mostly on 4.

Kennicott's *Toluca lineata* (U. S.-Mexican Bound. Surv., **2**, p. 23, pl. 21, fig. 2, 1859, from valley of Mexico) is perfectly represented by 987a.

Tantilla moesta cuniculator subsp. nov.

Tantilla moesta Schmidt and Andrews, Field Mus. Nat. Hist., Zool. Ser., **20**, pp. 180, 181, 1936.

Type from Mérida, Yucatán. No. 19408 Field Museum of Natural History. Female. Collected by Eunice Blackburn, 1934. Paratypes two topotypical females, Nos. 19407, 20605, Eunice Blackburn and E. Wyllys Andrews, 1934.

Diagnosis.—Similar to *Tantilla moesta*, having seven supralabials, two postoculars, rostral scarcely visible from above, a broad frontal and a light, dark-bordered nuchal collar; differing from *moesta* in

number of subcaudals (49 to 53), absence of pigment on ventral scales, presence of a dark lateral area sharply differentiated from a somewhat lighter dorsal color, snout light, and a small or large light spot behind eye.

Description.—Portion of rostral visible above less than half the length of internasals; latter two and one-half times as long as broad, tapering laterally; prefrontals slightly broader than long, more than twice as long as internasals; frontal hexagonal, longer than its distance from end of snout, about twice the width of a supraocular; nasal divided, narrowly in contact with preocular; one preocular, two postoculars; parietals slightly longer than their distance from end of snout; temporals 1-1; seven supralabials, third and fourth entering eye; seven infralabials, the first separated from each other by contact of mental and anterior chin-shields; latter twice as long as posterior chin-shields; four infralabials in contact with anterior chin-shields.

Scales in 15 rows throughout, smooth; ventrals 149; anal divided; caudals 49; total length 101; tail length 20.

Dorsal surface of head dark brown, except a broad area on tip of snout, the lower edges of the first four supralabials, a rounded area behind eye extending to lip, and the extreme posterior edges of the parietals and secondary temporals, which are white or cream; a light, dark-bordered nuchal collar involving two rows of scales on the neck, the posterior tip of the parietals and secondary temporals and the posterior half of the last supralabial; a broad, tan dorsal area on body, rather sharply defined from a darker lateral area involving the first, second, and third scale rows; a dimly visible, dorsolateral light stripe about one scale wide; lateral dark stripe becoming somewhat lighter ventrally, completely disappearing at the edges of the ventrals; ventral surface immaculate, save a few dark markings on the infralabials.

Notes on paratypes.—The scutellation of the head in the two paratypes is practically identical with that of the type. The first infralabials are in contact with each other medially in one. The ventrals and caudals of 19407 and 20605 are, respectively, 154, 53, and 140, 49; total and tail lengths 96 and 20, and 94 and 19. In coloration the only notable variation is in the size of the light spot behind the eye, which is very small and inconspicuous in the smallest specimen (20605).

Comparisons.—The subspecies differs from *moesta moesta* in the number of subcaudals (49 to 53 in *m. cuniculator*, 55 to 63 in *m.*

moesta) and in coloration. The typical form has the entire belly and the mental region pigmented, the nuchal ring complete ventrally, the snout dark, lacks a light spot posterior to the eye, and shows no differentiation in coloration of the lateral and dorsal surfaces of the body.

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EIGHT NEW BATS OF THE GENUS RHINOLOPHUS

BY COLIN CAMPBELL SANBORN

CURATOR OF MAMMALS

During recent work on a revision of the bats of the genus *Rhinolophus* eight new forms were discovered. These are described here in advance of a complete report, which will appear later.

I wish to thank Mr. M. A. C. Hinton and Mr. T. C. S. Morrison-Scott for their help while I was at the British Museum (Natural History) and for permission to describe two of these new forms. Through the generosity of Dr. H. Boshma and Dr. G. C. A. Junge of the Rijksmuseum van Natuurlijke Historie in Lieden, I am able to describe two others.

This work was done with the aid of a Fellowship from the John Simon Guggenheim Memorial Foundation and with the permission of Field Museum of Natural History, during parts of 1938 and 1939.

Rhinolophus keyensis annectens subsp. nov.

Type from Wetter Island, Southwest Islands, Flores Sea, Dutch East Indies. No. C, 1372 Rijksmuseum van Natuurlijke Historie, Leiden. Adult male in alcohol. Collected June 7, 1898, by Dr. Schardler.

Characters.—An Oriental member of the *megaphyllus* group closely related to *Rhinolophus keyensis* and *R. virgo*.

Length of metacarpals as in *keyensis* and *virgo*, fourth metacarpal being longest and third longer than fifth. Second phalanx of third metacarpal more than one and one-half times length of first phalanx; in the others it is barely equal to or is shorter than the first phalanx. Intermediate in size between *keyensis* and *virgo*. Sella parallel-sided for about three-quarters of the distance from base, and the sides converging slightly to square tip. The connecting process rises well back from the edge of the sella, farther back than in *keyensis*. Lancet high, narrow, and rather sharply pointed, sides straight as in *keyensis*.

The skull is so badly broken that no adequate description can be given of it, but it appears to be very much like that of *keyensis*. Upper premolar two is in the toothrow. Lower premolar three is almost in the row while in *keyensis* it is external. This could easily be individual variation. The infraorbital bridge is about half as wide as in *keyensis*.

Measurements.—Forearm 39.2; third finger, metacarpal 29.7, first phalanx 11.6, second phalanx 17.7; fourth finger, metacarpal 30, first phalanx 8.4, second phalanx 10.5; fifth finger, metacarpal 29.2, first phalanx 8.7, second phalanx 10.9; tibia 25.5; tail 17.4. Ear 19; height of lancet 8; width of sella 1.5; width of horseshoe 8.5. Skull broken; upper toothrow 6.4.

Specimens examined.—One, the type.

Remarks.—This form is a link between *Rhinolophus virgo* of the Philippines and *R. keyensis* of the Key Islands.

Rhinolophus chaseni sp. nov.

Rhinolophus minor Pousargues, Mission Pavie Indo-Chine, Etudes Diverses, 3, p. 554, 1904; Kloss, Jour. Nat. Hist. Soc. Siam, 4, p. 80, 1921.

Type from Pulo Condore, off the southeast coast of Cochin China. No. 21.10.8.3 British Museum (Natural History). Adult male in alcohol. Collected November 12, 1920, by C. B. Kloss.

Characters.—An Oriental member of the *megaphyllus* group related to *R. malayanus*, and with same wing formula.

Metacarpal of third finger shortest; metacarpals of fourth and fifth fingers about equal. Second phalanx of third finger less than one and one-half times the length of the first phalanx.

Like *malayanus* but sella wider and more constricted, lancet shorter and ear longer. The skull larger in every way but in general similar to that of *malayanus*. Upper premolar two in the toothrow; lower premolar three external.

Measurements.—Forearm 41.1; third finger, metacarpal 30.6, first phalanx 11.8, second phalanx 17.4; fourth finger, metacarpal 31.4, first phalanx 8.5, second phalanx 10.5; fifth finger, metacarpal 31.7, first phalanx 9.3, second phalanx 10.9. Ear 21; tibia 20.6; tail 17.7. Base of sella 2.4, tip 2.

Skull: greatest length 18.8; condylo-basal length 16.1; palatal length 2.5; width of nasal swellings 5.4; interorbital width 2.6; zygomatic width 9.8; mastoid width 8.9; width of braincase 7.7; upper toothrow 7.3; width across canines 5; maxillary width 7.1; supraorbital length 5.

Specimens examined.—One, the type. Also the cotypes and large series of *R. malayanus.*

Remarks.—*Rhinolophus chaseni,* while not appearing to have any very outstanding characters, is different from any of the forms related to *borneensis* and *malayanus* and is geographically distant from all except *malayanus.* It is named for Dr. F. N. Chasen, Director of the Raffles Museum.

Rhinolophus thomasi latifolius subsp. nov.

Rhinolophus sp. Osgood, Field Mus. Nat. Hist., Zool. Ser., 18, p. 219, 1932.

Type from Muong Moun, Tonkin, French Indo-China. No. 32230 Field Museum of Natural History. Adult female. Collected March 14, 1929, by R. E. Wheeler. Orig. No. 39.

Characters.—Like *thomasi* in size and wing structure, second phalanx of third metacarpal being more than one and one-half times the length of the first phalanx, and second phalanx of fifth metacarpal shorter than first phalanx. The parallel-sided sella is much wider than in *thomasi,* being 2.3 against 1.8 mm., and the ear and tail are a little longer.

The skull has the same characters found in *thomasi,* being short and relatively broad, with maxillary width greater than length of upper toothrow; total length between four and four and one-half times supraorbital length, with low nasal swellings; the teeth are slightly narrower. Upper premolar two is in the toothrow. Lower premolar three is external except in one specimen, where it is in the toothrow.

Measurements.—Type (paratypes in parentheses): Forearm 42.5 (42.6–45.7). Skull: greatest length 18.4 (18.2–18.7); condylo-basal length 15.7 (15.6–16); palatal length 2.1 (1.9–2.2); width across nasal swellings 5.1 (5.1–5.3); interorbital width 2.6 (2.5–2.5); zygomatic width 9.7 (9.2–9.8); mastoid width 9.2 (8.8–8.9); braincase 8 (7.6–8.1); upper toothrow 6.8 (6.8–7); width across canines 4.9 (4.6–4.9); maxillary width 7.3 (7–7.2).

External measurements of alcoholic specimen: Forearm 44.7; third finger, metacarpal 33.6, first phalanx 13.5, second phalanx 20.8; fourth finger, metacarpal 34.9, first phalanx 10.4, second phalanx 12.3; fifth finger, metacarpal 35.7, first phalanx 10.7, second phalanx 9.6. Ear 20; tail 24; tibia 18.

Specimens examined.—Total five. French Indo-China: Muong Moun, Tonkin, one male (type), one female (alc.); Muong Mo, Tonkin, three females.

Remarks.—The wider sella will easily separate this form from typical *thomasi*. *Rhinolophus thomasi* was formerly known from the type locality only, Karin Hills, Burma, but *R. t. latifolius* and the next form show that it has a wide range both north and south of Burma.

Rhinolophus thomasi septentrionalis subsp. nov.

Rhinolophus affinis tener Osgood, Field Mus. Nat. Hist., Zool. Ser., **18**, p. 216, 1932.

Type from Nguluko (27.5° N. Lat., 100° 15′ E. Long.), north of Likiang, Yunnan, China. No. 32291 Field Museum of Natural History. Adult male. Collected February 9, 1929, by Herbert Stevens.

Characters.—Like *thomasi* in wing structure, and in shape and size of sella and lancet, but in other parts much larger. Skull larger and upper premolar two only half in row instead of being wholly in row. Posterior edge of palatine narrower, less rounded than in *thomasi* and *t. latifolius*.

Measurements.—Type (paratypes in parentheses): Forearm 51.6 (51–55). Skull: greatest length 20.6 (19.8–20.9); condylo-basal length 18.1 (17.1–18); palatal length 2.4 (2.1–2.5); width across nasal swellings 5.6 (5.3–5.5); interorbital width 2.6 (2.5–2.8); zygomatic width 10.5 (10.5–10.9); mastoid width 9.7 (9.4–9.8); braincase 8.2 (8.1–8.6); upper toothrow 8.3 (7.6–8.1); width across canines 5.8 (5.3–5.7); maxillary width 8.5 (8 8.6).

External measurements of 15 alcoholic specimens: Forearm 52–55; third finger, metacarpal 36.9–39.5, first phalanx 15.6–18, second phalanx 26.5–29.8; fourth finger, metacarpal 39–41.5, first phalanx 11.3–13.1, second phalanx 15.1–18; fifth finger, metacarpal 40.5–43.5, first phalanx 13.2-15, second phalanx 9.9-12.5. Ear 19–21; tail 20.3–24.9; tibia 19.7-21.5.

Specimens examined.—Total 25. Nguluko, Yunnan, China, 11 males (6 alc.), 12 females (9 alc.) (F.M.). Su Shan Chang, Likiang, Yunnan, China, 1 male, 1 female (Amer. Mus. Nat. Hist.).

Remarks.—The wing structure and maxillary width easily identify this bat. The large size separates it from typical *thomasi*.

Rhinolophus osgoodi sp. nov.

Rhinolophus lepidus subsp. Osgood, Field Mus. Nat. Hist., Zool. Ser., **18**, p. 214, 1932.

Type from Nguluko (27° 5′ N. Lat., 100° 15′ E. Long.), north of Likiang, Yunnan, China. No. 33296 Field Museum of Natural History. Adult male. Collected February 27, 1929, by H. Stevens.

Characters.—Externally very like *R. lepidus* but sella parallel-sided, connecting process more rounded and lancet less hastate. General color above light brown, base of hairs light gray; below light gray. Fifth metacarpal usually a trifle longer than fourth; third shortest.

Skull small for a bat with so long a forearm. Shape as in *lepidus* but smaller with especially shorter toothrows. Mastoid width greater than zygomatic width. Upper premolar two in row; lower premolar three external or half in row.

Measurements.—Type (paratypes in parentheses): Forearm 43.3 (41.5–45.8). Skull: greatest length 16.2 (16.2–16.4); condylo-basal length 14.4 (14.2–14.5); palatal length 2.4 (2.4–2.6); width of nasal swellings 4.3 (4.2–4.3); interorbital width 2.1 (2.1–2.2); zygomatic width 7.7 (7.6–7.7); mastoid width 8 (8–8.2); width of braincase 6.7 (6.7–6.9); upper toothrow 5.8 (5.7–5.8); across canines 3.8 (3.5–3.8); maxillary width 5.8 (5.6–5.8).

External measurements of seven alcoholic specimens: Forearm 42.9–45.8; third finger, metacarpal 32.8–33.9, first phalanx 11.7–13.6, second phalanx 14.7–16.3; fourth finger, metacarpal 33.2–34.5, first phalanx 8.8–9.9, second phalanx 10.5–12.5; fifth finger, metacarpal 33.9–34.8, first phalanx 10.5–11.8, second phalanx 10.3–12.2. Ear 12–20; tail 17.5–20.8; tibia 16.6–18.2.

Specimens examined.—Total 10. Nguluko, Yunnan, China, 7 males (4 alc.), 3 females (alc.).

Remarks.—As Dr. Osgood has already pointed out (l.c.), this species combines characters found in both the *lepidus* and *refulgens* sections. The greater mastoid width is a character of *lepidus* while the parallel-sided sella is found in *refulgens* and *feae*. The skull is smaller than in any of these. The species is named in honor of Dr. Osgood, who first noticed these differences but who did not have the material needed at the time to work out the characters fully.

Rhinolophus formosae sp. nov.

Type from Formosa. No. 46001 Field Museum of Natural History. Adult male in alcohol. Collected by M. Maki.

Characters.—A member of the *luctus* group, about the size of *beddomei.* Sella higher but narrower than that of *trifoliatus.* Lancet long, sides not concave, tip blunt, forming a long triangle. Ears with short, blunt point, being but slightly concave on outer edge. Wing structure and attachment as in all other members of the *luctus* group. Color very dark brown.

Skull about the size of *beddomei* but much narrower. Sagittal crest sloping gradually toward post-nasal depression. Upper premolar two in row; lower premolar three in row, but in type more crowded on one side than on the other.

Measurements.—Forearm 60.2; third finger, metacarpal 40.4, first phalanx 23.5, second phalanx 30.5; fourth finger, metacarpal 47.4, first phalanx 12.5, second phalanx 21.8; fifth finger, metacarpal 48.8, first phalanx 14.4, second phalanx 21.8. Ear 32; tibia 32.8; tail 39.8. Skull broken: greatest length 27.4; width across nasal swellings 6.5; zygomatic width 12.4 plus; mastoid width 11.7; width of braincase 10; upper toothrow 10.2.

Specimens examined.—One, the type.

Remarks.—The nearest geographic neighbor of *Rhinolophus formosae* is *R. lanosus* from Fukien, which it resembles in some characters, although it is much smaller. Considering the solitary and retiring habits of this group of bats it is not surprising that a member of it has not been found in Formosa until now.

Rhinolophus aethiops diversus subsp. nov.

Type from Bakel, Senegal, French West Africa. No. 19.7.7.2774 British Museum (Natural History). Adult female in alcohol. Collected September 27, 1887. From the Lataste collection.

Characters.—Averages smaller than either *a. aethiops* or *a. eloquens*, with a narrower horseshoe and sella and a shorter lancet. The type, when dried, is darker than *aethiops*, being in general a faded brown. The hairs above are of uniform color to the base; below they are slightly darker at the base. The type, however, has been in alcohol for many years and the only skin is more than one hundred years old.

The type skull is like that of *aethiops* but much smaller. Upper premolar two is present on one side only and is so minute that it is hard to see even with a lens. Lower premolar three is present on both sides and is also very minute.

Measurements.—Type (maximum and minimum of topotypes in parentheses): Forearm 53.2 (52.8–55.6); third finger, metacarpal 40.6 (39–40.7), first phalanx 16 (16–17.7), second phalanx 30.3 (30–31.5); fourth finger, metacarpal 41.9 (41–42.7), first phalanx 9.6 (9.8–10.3), second phalanx 18.7 (17.9–18.7); first finger, metacarpal 41.9 (42–44), first phalanx 12.6 (12.5–13.2), second phalanx 13.9 (14.1–14.6). Ear 27 (27–28); tail 28.6 (28.8–32.7); tibia 22.6 (22.8–23.5). Skull of type: greatest length 23.1; condylo-basal

length 19.6; palatal length 2.9; width across nasal swellings 6.1; interorbital width 2.6; zygomatic width 11.9; mastoid width 10.5; width of braincase 9.5; upper toothrow 8.8; width across canines 6.6; maxillary width 8.7; supraorbital length 6.4.

Specimens examined.—Total 7. Bakel, Senegal, 2 males (alc.), 2 females (alc.); "River Gambia," 1, no sex. Nerokoro, near Tambikunda, Sierra Leone, 1 male (alc.), 1 female (alc.). All in British Museum.

Remarks.—All the forms of *R. aethiops* are very much alike except *a. hildebrandti*, which is the largest. *R. diversus* does not agree very well either with typical *aethiops* from Angola or with *a. eloquens* from the Sudan, being smaller and darker. The two specimens from Sierra Leone are not included in the measurements as they are both subadult and are only referred to *R. diversus*.

Rhinolophus arcuatus angustifolius subsp. nov.

Type from Wetter Island, Southwest Islands, Flores Sea, Dutch East Indies. No. D, 1371 Rijksmuseum van Natuurlijke Historie, Leiden. Adult male in alcohol. Collected June 7, 1898, by Dr. Schardler.

Characters.—Like *arcuatus* from the Philippines but lancet and horseshoe a little narrower and sella much narrower, 2.1 at base against 3.5 in *arcuatus*. Tail the same length as tibia instead of being shorter. In this character it approaches *toxopei*, in which the tail is longer than the tibia. Wing structure as in *arcuatus*.

Skull as in *arcuatus* but upper premolar two half external, the canine and premolar three being separated by a narrow space. Nasal swellings converging as in *arcuatus*, being narrower across top than in *beccarii*.

Measurements.—Forearm 46.6; third finger, metacarpal 35.2, first phalanx 14.1, second phalanx 22.3; fourth finger, metacarpal 35.7, first phalanx 9.7, second phalanx 13.6; fifth finger, metacarpal 36.5, first phalanx 10.3, second phalanx 12.3. Ear 22; tail 21.6; tibia 21.6. Skull: greatest length 20.1; condylo-basal length 16.8; palatal length 1.8; width across nasal swellings 5.2; interorbital width 1.7; zygomatic width 9.6; mastoid width 9.4; width of braincase 8.1; upper toothrow 7.8; width across canines 5.3; maxillary width 7.5.

Specimens examined.—One, the type.

Remarks.—This form represents an extension of the range of true *arcuatus*, being less aberrant than *toxopei* from Buru Island to the north. With *arcuatus* now known from Sumatra and Wetter Island, it should be found on intermediate islands or in the Celebes.

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A NEW CORAL SNAKE FROM BRITISH GUIANA

BY KARL P. SCHMIDT

CURATOR OF AMPHIBIANS AND REPTILES

The Sewell Avery Expedition to British Guiana for Field Museum in 1938, under the leadership of Emmet R. Blake, penetrated to the Brazilian boundary in the Courantyne District to make zoological collections. While the principal object of the expedition was the collecting of birds and mammals, a small collection of reptiles, amphibians, and fishes was obtained. This material, contained in two gasoline tins, was happily recovered intact after the calamitous wreck of the expedition's boats, on the return trip, in the King William Rapids, some miles below King Frederick William IV Falls on the Courantyne River. The tins contained enough air, with the bouyancy of their box, to float them. The collection of reptiles and amphibians amounts to 160 specimens, including 111 frogs, 39 lizards, and 10 snakes. Among the snakes is a single coral snake which is evidently undescribed, notable for its brilliant coloration, even in the brilliantly colored genus *Micrurus*. It is pleasant to name such a well-marked new species for Mr. Sewell Avery, Trustee of Field Museum, whose support of the Museum's research interests made possible its discovery.[1] The diagram of the color pattern is the work of Mr. Martin Melody.

Micrurus averyi sp. nov.

Type from Courantyne District, near the Brazilian border, at Latitude 1° 40′ N. and Longitude 58° W. No. 30956 Field Museum of Natural History. Adult female. Collected September 22, 1938, by Emmet R. Blake.

[1] Mr. Blake's collecting in British Guiana in 1937 likewise yielded a single coral snake which proved to be the distinctive and remarkable *Leptomicrurus collaris*, described in 1837. My discussion of this specimen (Schmidt, 1937) unfortunately omitted reference to a paper on the identical topic by Joseph C. Thompson (1913). While Thompson's conclusions anticipate mine in part, they do not alter my statement of the history of the species.

Diagnosis.—A species of *Micrurus* with the rings not in triads, head almost entirely black, no nuchal ring, and with relatively few black rings. Allied, presumably, to *M. corallinus,* but distinguished by the absence of the nuchal black ring, the smaller number of narrower black rings, and the reduction of the yellow rings to spots.

Description of type.—Head slightly wider than body, snout broad as seen from above, eyes small, somewhat upwardly directed. Head shields normal in arrangement; upper labials seven–seven; lower labials seven–seven; anterior and posterior chin shields about equal; preoculars one–one, postoculars two–two; temporals one–one, and one–two; ventrals 210; anal divided; caudals 34.

Eleven black rings on the body, each bordered narrowly by yellow, and separated by extensive red zones; the black rings two dorsal scale lengths in width, and covering two ventrals; the red zones extending over 12 to 18 ventrals; scales in the red zones entirely without black spotting; yellow borders of the black zones about one-half ventral wide, dorsally frequently interrupted, so that they form interrupted series of spots; the head black to a point behind the tips of the parietals, including the third temporal on each side, the black extending obliquely forward to cross the tips of the second pair of chin shields; the black narrowly bordered with yellow behind the chin shields; an irregular spot of yellow on each anterior chin shield; a yellow spot on labials 5 and 4, reduced to a trace on labials 3 and 2; red rings on tail narrower than the black, almost entirely obscured by black pigment, their position clearly defined by the sharply marked narrow yellow border.

Measurements of type.—Total length 670, tail 58.

Remarks.—The type locality may be further defined as the Boundary Commission's "Boundary Camp," at about 2,000 feet above sea level, at head of Itabu Creek. This creek enters the New River, an affluent of the Courantyne, at New River Depot.

The status and relations of the present form must remain somewhat obscure until male specimens are available for study. I have elsewhere shown (Schmidt, 1936) that the species *Micrurus corallinus* of authors is an *omnium gatherum* of forms, some of which are sharply distinguished from true *corallinus* of eastern Brazil by the presence of supra-anal tubercles in males. The relations of *averyi* may be with *corallinus,* from which it is distinguished by its small number of black rings and absence of a nuchal ring, and with *ornatissimus,* which has the yellow rings similarly reduced to spots, but which is otherwise radically different in color pattern.

The true coral snakes (i.e. the members of the family Elapidae, all venomous) now known from British Guiana are the following:

Leptomicrurus collaris Schlegel
Micrurus averyi sp. nov.
Micrurus psyches Daudin
Micrurus lemniscatus Linnaeus
Micrurus surinamensis Cuvier
Micrurus hemprichii Jan

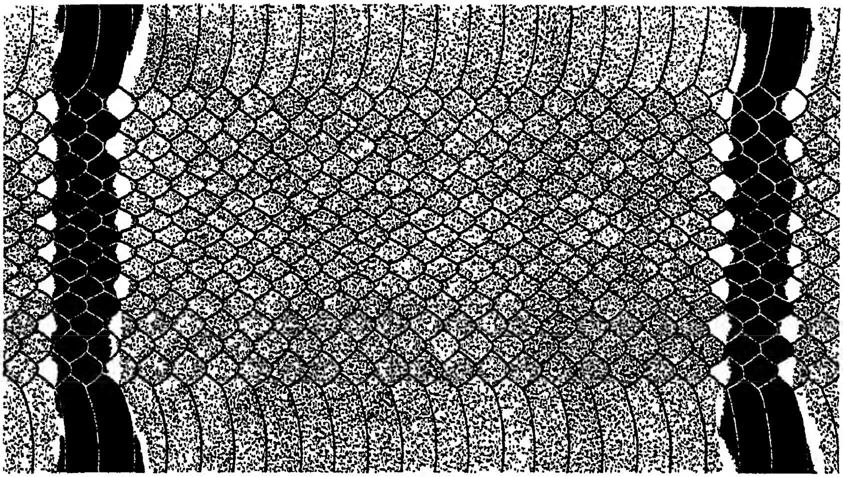

FIG. 5. Color pattern of type of *Micrurus averyi* sp. nov. Red shown in stipple.

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REPTILES AND AMPHIBIANS FROM SOUTHWESTERN ASIA

BY KARL P. SCHMIDT
CURATOR OF REPTILES AND AMPHIBIANS

Field Museum's interest in the herpetological fauna of southwestern Asia dates from the arrival of a small collection of lizards and snakes obtained by Dr. Henry Field in Iraq and Trans-Jordan in the course of the Marshall Field North Arabian Desert Expedition of 1928. The fact that this collection of twelve specimens, obtained incidentally in the course of an archaeological survey, included a new species of poisonous snake, conspicuous by reason of its size and by the fact that it has horn-like knobs over the eyes, is impressive evidence that this part of the world, so long known in history, is still relatively unexplored zoologically. As a natural result, Dr. Field, enthusiastically seconded by Mr. Richard A. Martin, engaged in much more extensive zoological collecting in the course of the Field Museum Anthropological Expedition to the Near East in 1934. Their efforts resulted in the collecting of some 1,900 specimens of amphibians and reptiles. No opportunity has been neglected to add to our collections from this region. Yusuf Lazar, an Assyrian, who had been employed as a zoological and botanical collector in Iraq on the Near East Expedition, has continued collecting in subsequent years; 208 specimens of reptiles collected through his efforts have been presented to Field Museum by Dr. Field. Dr. Field and Mr. Martin have been constantly helpful in geographic and other questions in the course of the preparation of the present work. I am indebted also to Mr. H. W. Parker, of the British Museum (Natural History), for advice on various taxonomic problems. The map showing the localities mentioned is the work of Mr. Paul Wong.

Friends of Dr. Field and of the Museum have contributed to the growing collection from the region as a whole. Among these especial mention may be made of Dr. Walter P. Kennedy, of the Royal College of Medicine, Baghdad; the late Wing-Commander

A. R. M. Rickards; Mr. E. S. Fraser of the Nairn Overland Transport Company, at Rutba, Iraq; Dr. Calvin W. McEwan, of the Oriental Institute of the University of Chicago, who collected in Hatay; and Dr. Ernst Herzfeld, former director of the Oriental Institute Expedition at Persepolis, Iran, who obtained a considerable number of specimens of amphibians and reptiles. During the past twelve years the Iraq Petroleum Company has rendered valuable assistance to members of Museum expeditions, and two members of its staff, Dr. P. Y. Shuwayhat and Dr. P. S. Manasseh, have sent specimens of reptiles to the Museum. Dr. Georg Haas, of Hebrew University, Jerusalem, has been in active correspondence with Field Museum since 1936, and numerous additions to the herpetological collections have been received from him by gift and exchange. In the systematic list of the collection which follows, the collectors are Dr. Henry Field and Mr. Richard A. Martin, except as otherwise stated.

We are indebted to the Museum of Vertebrate Zoology of the University of California for the loan of a small collection from the border of the Persian Gulf, which has been included in the present report, adding three species to the list. The total collection here reported includes 114 species, and amounts to 2,302 specimens, of which six are salamanders, 989 frogs and toads, 961 lizards, 319 snakes, and 27 turtles. The localities from which specimens have been received are shown on the accompanying map. Recently accepted spellings of place-names have been used to conform, whereever possible, to those adopted by the Permanent Committee on Geographical Names of the Royal Geographical Society, London. The following names must be noted: Hatay, formerly *Sanjak* of Alexandretta, and now part of the Republic of Turkey; Iran=Persia; Iraq=Mesopotamia; Kish=Tell el Uhaimir; and Shah Abdul Azim=Rayy. Geographical names in brackets have been inserted to elucidate the text.

Aside from the fact that the basic zoological exploration of southwestern Asia is still far from complete, the herpetological fauna of this region is of great biological interest and importance. There are complicated problems in zoogeography, involving faunal relations with Europe, central Asia, the Oriental region, and Africa, and exhibiting the interaction of animal communities adjusted to desert, savanna, forest, and mountain habitats. No less interesting are the more strictly ecological relations with the environmental factors (see *Agama stellio picea*, for example), and the evolutionary

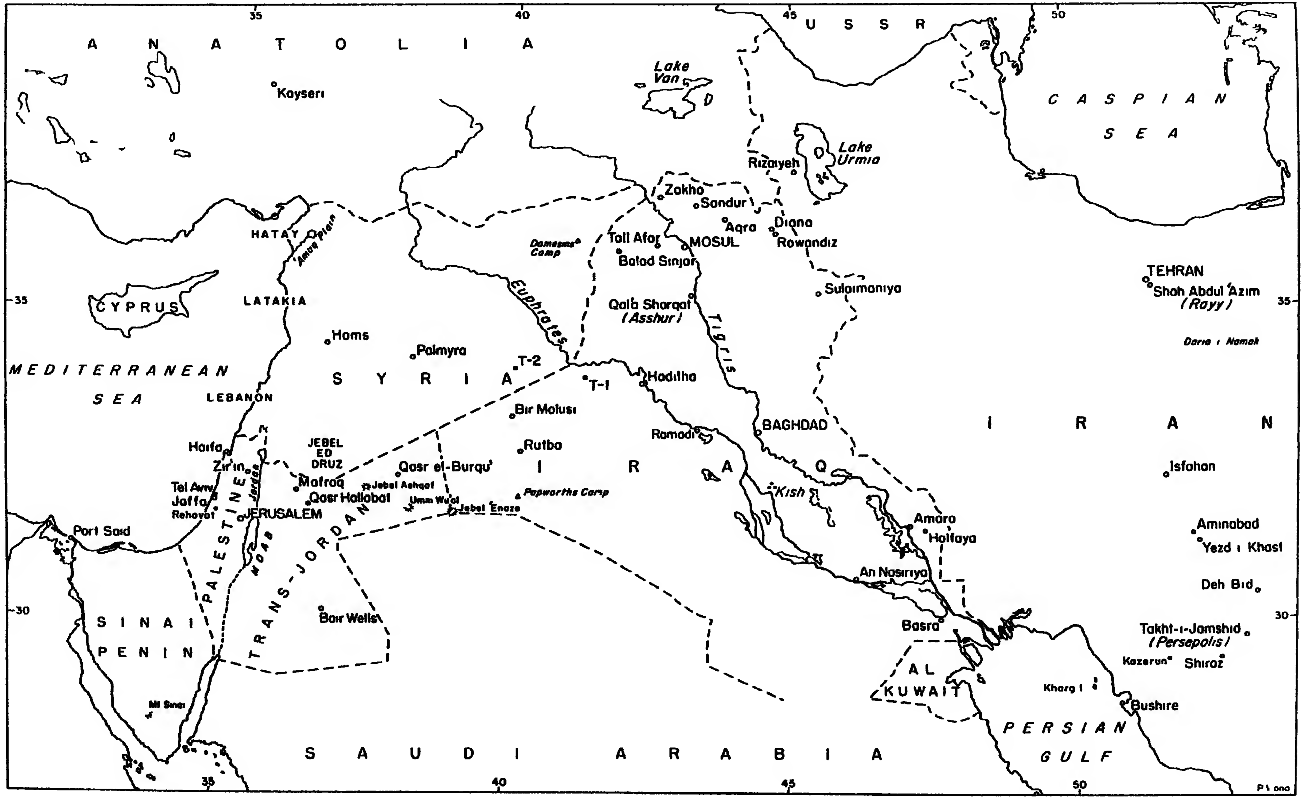

FIG 6. Map of southwestern Asia showing localities mentioned in the text.

implications of the structural adaptations, which, especially in the desert forms, exhibit notable parallelisms with snakes and lizards from desert regions in other parts of the world. With glimpses of so much of biological interest, it is disappointing to find that even the identification of species in the present list is of necessity provisional in many genera. Much fundamental taxonomic study, depending on the assembly of adequate collections, remains for the future; this will involve, in particular, the partition of wide-ranging forms into subspecies correlated with geographic factors.

CAUDATA

Neurergus crocatus crocatus Cope.

Neurergus crocatus Cope, Proc. Acad. Nat. Sci. Phila., 1862, p. 343, 1862—Urmia, Persia (now Rizaiyeh, Iran).

IRAQ: Aqra, 6 (19627–32).

The type locality, presumably in the Lake Urmia (Rizaiyeh) drainage, is not more than 140 km. distant from Aqra, and while our specimens are from the Tigris drainage, their correspondence with the original description in details of coloration is so close that they clearly represent typical *crocatus*.

All our specimens are females. The largest measures 167 in total length, tail 90, arm 29, leg 30, width of head 14.6, length of head to gular fold 18. The toes of the appressed hind limb reach nearly to the elbow of the forelimb. A half-grown specimen, with three gill rami (longest 5 mm.) on one side and only one on the other, measures 81, tail 42, arm 12, leg 13.

While the agreement in structural characters with *Neurergus strauchii* Steindachner is close, the radical difference in color pattern and the much more elongate body in *strauchii* (in which the appressed limbs barely meet) indicates that the two forms are distinguishable, though the type locality of *strauchii*, Lake Van in eastern Anatolia, is not far from the range of true *crocatus*. Werner records *crocatus* from Buldur (?Burdur), in western Anatolia, but I infer that his specimens are more like *strauchii* than like our *crocatus*, and may well represent a distinct form. Nesterov's *Neurergus crocatus derjugini* and *N. c. microspilotus*, from the mountains south of our area, are more directly allied to *crocatus crocatus* in body form than to *strauchii*, but both are quite different in color pattern from our specimens, and apparently represent distinct geographic forms.

Wolterstorff (1926, p. 1) still considers the type locality of *crocatus* to be unknown. This was omitted by Cope merely as an

oversight; Dunn records the type from "Ooromiah" (=Urmia), Persia (1917, p. 27); this is now known as Lake Rizaiyeh, Iran.

SALIENTIA

Bufo viridis viridis Laurenti.

Bufo viridis Laurenti, Synopsis Rept., p. 27, pl. 1, fig. 1, 1768—Vienna.

Bufo viridis viridis Mertens, Senckenbergiana, 8, p. 258, 1926.

HATAY: Amuq Plain, 1 (25351, C. W. McEwan).

IRAN: Isfahan, 15 (21018); Shah Abdul Azim, 12 (21019).

IRAQ: Amara, 76 (19838–63); Baghdad, 12 (21138, 26396–8, Yusuf Lazar); Balad Sinjar, 1 (19870); Halfaya, 5 (19864); Tall Afar, 270 (juv.) (19865–9); Tell Asmar, 5 (19837).

The specimens here listed are readily distinguishable from the few European specimens at hand, but it is obvious that a comprehensive revision of this species into geographic races will require a detailed study of large series from the great area over which it ranges. The problem may be compared to the similarly unsolved partition of *Rana pipiens* in North America. There are no conspicuous differences between specimens from Iran and Iraq.

Hyla arborea savignyi Audouin.

Hyla savignyi Audouin, Descr. Egypte, Rept., Suppl., pl. 2, fig. 13, 1812—Syria (presumed).

Hyla arborea savignyi Mertens, Abh. Ber. Mus. Magdeburg, 3, p. 356, 1924.

HATAY: Amuq Plain, 1 (25350, C. W. McEwan).

IRAN: Persepolis, 1 (21025).

IRAQ: Amara, 5 (19871–5); Baghdad, 28 (20872, Field and Martin; 22683, 25137, Yusuf Lazar).

The single Persian specimen exhibits no appreciable difference from those from Baghdad.

Rana ridibunda ridibunda Pallas.

Rana ridibunda Pallas, Reise Russ. Reich, 1, p. 458, 1771—Gurev, north coast of the Caspian Sea.

ANATOLIA: Kayseri (Kaisarieh), 1 (25907, L. Forcart).

HATAY: Amuq Plain, 3 (25352–4, C. W. McEwan).

IRAN: Isfahan, 6 (21024); Persepolis, 29 (21026); Shah Abdul Azim, 40 (21017–18, 21021); Yezd-i-Khast, 74 (21022–23).

IRAQ: Amara, 270 (19748–71); Baghdad (vicinity of), 9 (26394–5, 26399, Yusuf Lazar); Balad Sinjar, 11 (19778); Diana, 8 (19784); Haditha, 16 (19773); Halfaya, 11 (19772); Mosul, 5 (19774); Sandur, 5 (19780); Tall Afar, 41 (19775–7, 19779); Zakho, 31 (19781–3).

It is disappointing to be unable to reach a satisfactory conclusion as to the distinctness of *Rana ridibunda susana* from the study of this large series. The leg-length character proposed by Boulenger (1905, p. 552) in describing *susana* is subject to great variation; the difference between individuals from a single locality may be fully as great as that between Boulenger's specimens from Susa (Shush), Iran, and the specimens referred by him to *Rana ridibunda ridibunda*. In our series from Amara, which is geographically not far distant from Susa, and in the lower Tigris-Euphrates lowland, the length of the tibia relative to that of the body (t/b) varies from 0.46 to 0.51 in both sexes; and as this is slightly lower than the same proportion in specimens from northeastern Iraq (0.48–0.56, male; 0.46–0.53, female), there is some correspondence to Boulenger's distinction of the two forms; but the overlap of variation in the two series is much too great to warrant the distinction of a named form.

That the relative length of the tibia changes with age is clearly shown in the series from Persepolis, assorted according to size:

Sex	Number of specimens	Range in size	Extremes t/b
Male	4	80–90	0.49–0.50
Male	6	72–76	0.51–0.55
Female	4	108–121	0.45–0.48
Female	6	84–95	0.49–0.55

The large size of the specimens from Persepolis is not matched elsewhere. The largest male and female specimens from northeastern Iraq measure respectively 77 and 81 in body length; in the large series from Amara, the maxima are 78 and 93.

SAURIA

Stenodactylus sthenodactylus Lichtenstein.

Ascalabotes sthenodactylus Lichtenstein, Verz. Doubl. Mus. Berlin, p. 102, 1823.

Stenodactylus sthenodactylus Flower, Proc. Zool. Soc. Lond., 1933, p. 760, 1933.

IRAQ: Rutba, 4 (19676–9).

These differ considerably from Egyptian specimens, but as for so many other species, the definitive partition into geographic forms must await the study of extensive collections.

Alsophylax tuberculatus Blanford.

Bunopus tuberculatus Blanford, Ann. Mag. Nat. Hist., (4), 13, p. 454, 1874—Bahu Kalat, Mand, and near Bampur, Baluchistan.

SYRIA: Damesin's Camp, 1 (19739).

This specimen is referred to *tuberculatus* only on the precedent of Procter's record from Mesopotamia and Angel's from Syria. The range from Baluchistan to Syria, without differentiation, is somewhat improbable.

Alsophylax blanfordii Strauch.

Bunopus blanfordii Strauch, Mém. Acad. Sci. St. Pétersbourg, (7), **35**, p. 61, pl. 1, figs. 13, 14, 1887—Egypt (in errore).

ARABIA: Al Jubail, 70 km. north of Bahrein Island, 2 (MVZ 25620–1, R. P. Miller).

These specimens greatly extend the known range of *blanfordii*, which was known only from Bent's specimens from the Hadhramaut. It is evident that the type locality "Egypt" is erroneous, and that the cotypes, obtained from a dealer in terrarium specimens, really came from Arabia.

The larger specimen, a female, measures 115, body 48.4, tail 66.6, length of head 12.8, width of head 9.5, arm 19, leg 26. The smaller specimen is a male with broken tail. It measures 40.5 from snout to vent, and has 12 preanal pores.

Gymnodactylus scaber Heyden.

Stenodactylus scaber Heyden, in Ruppel, Atlas Reise nord. Afrika, Rept., p. 15, pl. 4, fig. 2, 1827—vicinity of Tor, Sinai.

Gymnodactylus scaber Duméril and Bibron, Erp. gen., **3**, p. 421, 1836.

IRAQ: Aqra, 1 (19684); Baghdad, 71 (19681–2, 19694, 20866–71, 22685, 22688, Field and Martin; 25139–47, 25150–1, Yusuf Lazar); Diyala, 4 (25148–9, 25152–3, Yusuf Lazar); Halfaya, 1 (19683); An Nasiriya, 7 (22690).

Gymnodactylus kotschyi Steindachner.

Gymnodactylus kotschyi Steindachner, Sitzber. Akad. Wiss. Wien, **63**, Abt. I, p. 329, pl. 1, fig. 1, 1870—Syros Island, Cyclades (restr. by Mertens and Muller, 1928).

HATAY: Amuq Plain, 1 (25338, C. W. McEwan).

Gymnodactylus kirmanensis Nikolsky.

Gymnodactylus kirmanensis Nikolsky, Ann. Mus. Zool. Acad. Sci. Petrograd, **4**, p. 381, 1899—Mons Ku-i-tuftan (Kuh-i-Taftan), in Sargado, and eastern Kirman.

IRAN: Persepolis, 1 (21007, Ernst Herzfeld).

Pristurus rupestris Blanford.

Pristurus rupestris Blanford, Ann. Mag. Nat. Hist., (4), **13**, p. 454, 1874 – Muscat, and Island of Karrak (?Kharg) near Bushire, Persian Gulf.

ARABIA: Aden, 8 (18220, A. R. M. Rickards).

These specimens may well be from the Hadhramaut instead of from the Aden region, as only part of Rickard's collection was specifically labeled.

Phyllodactylus elisae Werner.

Phyllodactylus elisae Werner, Verh. Zool. Bot. Ges. Wien, **45**, p. 14, pl. 3, fig. 1, 1895—ruins of Nineveh, near Mosul, Iraq.

IRAQ: Baghdad, 2 (19695-6); Mosul, 2 (19702-3).

Ptyodactylus hasselquistii hasselquistii Donndorff.

Lacerta hasselquistii Donndorff, Zool. Beytr., **3**, p. 133, 1789.

Ptyodactylus hasselquistii Boettger, Ber. Senck. Ges., **1879–80**, p. 194, 1880.

ARABIA: Aden, 4 (18221, A. R. M. Rickards).

IRAQ: Haditha, 2 (19699–700).

PALESTINE: Jerusalem, 1 (26881, Georg Haas).

SYRIA: Between Iraq Petroleum Company's Stations T-1 and T-2, two (19697–8).

Our series of this species is inadequate for any effective contribution to its partition into geographic races. Flower (1933, p. 764) comments on its extraordinarily sedentary habits, which contribute to its geographic variations.

Hemidactylus flaviviridis Rüppell.

Hemidactylus flaviviridis Ruppell, Neue Wirbelthiere Abyssinien, Amphibien, p. 18, pl. 6, fig. 2, 1835—Massaua Island, Eritrea.

IRAQ: Baghdad, 7 (22687, 22691, 25154 7, Yusuf Lazar; 28307, W. P. Kennedy); Tell Asmar, 1 (19692).

Hemidactylus turcicus Linnaeus.

Lacerta turcica Linnaeus, Syst. Nat., p. 202, 1758 – Turkey.

Hemidactylus turcicus Boettger, Ber. Offenb. Ver. Naturk., **1876**, p. 57, 1876.

HATAY: Amuq Plain, 1 (25339, C. W. McEwan).

IRAQ: Baghdad, 10 (22686, 25158 61, 28312, Yusuf Lazar).

Agama adramitana Anderson.

Agama adramitana Anderson, Contr. Herpetol. Arabia, p. 31, 1896– Hadhramaut.

ARABIA: Aden (or inland from Aden), 5 (18203-7, A. R. M. Rickards; 1850, British Museum).

Agama agilis Olivier.

Agama agilis Olivier, Voy. Emp. Ottoman, 4, p. 394, pl. 29, fig. 2, 1804—Baghdad, Iraq.

IRAN: Daria-i-Namak, 7 (20985 6, 20988); Isfahan, 1 (20989); Yezd-i-Khast, 62 (20987, 20990).

Males usually lack the dorsal pattern, and have a varying amount of blue on the belly and throat. A few of the males have peculiarly coarse dorsal scales. Females lack the blue color and have the conspicuous dorsal pattern.

Agama caucasica Eichwald.

Stellio caucasicus Eichwald, Zool. Spec., Rossiae Polon., 3, p. 187, 1829—Baku.
Agama caucasica Boulenger, Cat. Liz. Brit. Mus., 1, p. 367, 1885.

IRAQ: Asshur (Sharqat), 1 (19644); Diana, 3 (19641–3).

Agama microlepis Blanford.

Stellio microlepis Blanford, Ann. Mag. Nat. Hist., (4), 13, p. 453, 1874—Kush-Kizard, north of Shiraz, Iran.
Agama microlepis Boulenger, Cat. Liz. Brit. Mus., 1, p. 366, 1885.

IRAN: Shah Abdul Azim, 13 (20972-84).

Agama nupta De Filippi.

Agama nupta De Filippi, Giorn. Inst. Lomb., 6, p. 407, 1832—Persepolis.

IRAN: Persepolis, 4 (20997–21000).

Agama pallida Reuss.

Agama pallida Reuss, Mus. Senck., 1, p. 38, pl. 3, fig. 3, 1834—Upper Egypt.

IRAQ: Baghdad, 1 (19639); Euphrates, west bank, 1 (21915, P. A. Jarvis); Rutba, 14 (11359-60, 19662–73).

SYRIA: Homs, 2 (19674–5).

TRANS-JORDAN: Jebel Ashqaf (el Ashaqif), 1 (19661); Umm Wu'al, 1 (11068, Henry Field).

Agama persica Blanford.

Agama persica Blanford, Proc. Zool. Soc. Lond., 1881, p. 674, pl. 49, 1881—Deh Bid and Kazerun, Iran.

IRAQ: Amara, 1 (19654); Baghdad, 3 (20864, 25762–3, Yusuf Lazar).

TRANS-JORDAN: Qasr-el-Burqu', 1 (11069, Henry Field).

Agama ruderata Olivier.

Agama ruderata Olivier, Voy. Emp. Ottoman, 4, p. 395, pl. 29, fig. 3, 1804—Persia and northern Arabia.

IRAQ: Balad Sinjar, 2 (19652–3); Tall Afar, 4 (19648–51).

HATAY: Amuq Plain, 2 (25343–4, C. W. McEwan).

Agama sinaita Heyden.

Agama sinaita Heyden, in Ruppell, Atlas Reise nord. Afrika, Rept., p. 10, pl. 3, 1827—Sinai.

ARABIA: Aden, 7 (18208 14, A. R. M. Rickards); Hadhramaut, 2 (18450–51, A. R. M. Rickards).

SINAI PENINSULA: 1 (3907, British Museum).

Agama stellio stellio Linnaeus.

Lacerta stellio Linnaeus, Syst. Nat., p. 202, 1758—Delos, Cyclades, and Egypt (restr. to Delos, Mertens & Muller, 1928, p. 26).

Agama stellio Boulenger, Cat. Liz. Brit. Mus., 1, p. 368, 1885.

HATAY: Amuq Plain, 8 (25345-9, 25361, C. W. McEwan).

IRAQ: Aqra, 1 (19640).

PALESTINE: Rehovot (Rethoboth), 1 (26883, Georg Haas).

SINAI PENINSULA: Mount Sinai, 2 (3908 9, British Museum).

TRANS-JORDAN: Hammam-es-Sarakh near Qasr Hallabat, 1 (11070, Henry Field); Moab, 1 (1588).

Flower has pointed out some of the geographic variations of this species, which become of increased importance in view of the distinctness of *Agama stellio picea.* It is evident that the partition of the wide range remaining to *A. s. stellio* affords an attractive taxonomic problem.

Three eggs from Amuq Plain contain mature embryos. The eggs range in size from 24 x 15 to 27 x 15 mm. An embryo measures 76, body 32.

Agama stellio picea Parker.

Agama stellio picea Parker, Proc. Zool. Soc. Lond., 1935, p. 137, pl. 1, 1935 - Black Lava Desert of Trans-Jordan (32° 10′ N. Lat., 36° 40′ E. Long.).

TRANS-JORDAN: Qasr-el-Burqu', 5 (19655-9).

Our specimens agree in detail with Parker's description. His speculations on the functional relations of the remarkable coloration of this form with its environment are discussed by Klauber (1939, p. 65). The fundamental ecological importance of the heat economy of desert reptiles has only lately been appreciated.

Phrynocephalus arabicus Anderson.

Phrynocephalus arabicus Anderson, Ann. Mag. Nat. Hist., (6), 14, p. 377, 1894—plateau of the Hadhramaut.

ARABIA: Hadhramaut, 1 (184552, A. R. M. Rickards).

The single specimen is typical of this well-defined species.

Phrynocephalus scutellatus Olivier.

Agame scutellata Olivier, Voy. Emp. Ottoman, 5, p. 196, pl. 42, fig. 1, 1807—Mt. Sophia, near Isfahan, Iran.

Phrynocephalus scutellatus Mocquard, Bull. Mus. Hist. Nat. Paris, 16, p. 15, 1910.

IRAN: Yezd-i-Khast, 187 (20991 6).

I have followed Mocquard in adopting the name *scutellatus* in place of *olivieri* auct. Other authors have regarded Olivier's *Agame scutellata* as not properly binomial; but comparison with other descriptions in the same work seems to warrant Mocquard's conclusion.

Aporoscelis benti Anderson.

Aporoscelis benti Anderson, Ann. Mag. Nat. Hist., (6), 14, p. 376, 1894—near Makulla, Hadhramaut.

ARABIA: Wadi Du'an, near Hajarain, Hadhramaut, 2 (18202, 18449, A. R. M. Rickards).

Uromastix microlepis Blanford.

Uromastix microlepis Blanford, Proc. Zool. Soc. Lond., 1874, p. 656, pl. 53, 1874—Basra, Iraq.

ARABIA: Al Jubail, 70 km. north of Bahrein Island, 1 (MVZ 25622, R. P. Miller).

IRAN: Tehran, 2 (20885-6).

The specimens from Tehran are flat trade skins, purchased in the market.

The distinction of this species from *aegyptius* by the absence of enlarged lateroventral tubercles in *microlepis*, becomes difficult when these tubercles are reduced or few. The relations between the two forms require further study.

Uromastix aegyptius Forskål.

Lacerta aegyptia Forskål, Descr. Anim., p. 13, 1775—Egypt.

Uromastix aegyptius Anderson, Zool. Egypt, Amph. Rept., p. 129, pl. 14, 1898.

IRAQ: Baghdad, 4 (19485 8); Rutba, 1 (11357, E. S. Fraser).

Uromastix loricatus Blanford.

Centrotrachelus loricatus Blanford, Proc. Zool. Soc. Lond., 1874, p. 660, 1874—Bushire, Iran.

Uromastix loricatus Boulenger, Cat. Liz. Brit. Mus., 1, p. 409, pl. 32, 1885.

IRAQ: 1 (19645, W. P. Kennedy).

This specimen is probably from the same source, some fifty miles west of Baghdad, as the one recorded by Dr. Kennedy (1937, p. 748).

Varanus griseus Daudin.

Tupinambis griseus Daudin, Hist. Nat. Rept., 8, p. 352, 1803.

Varanus griseus Boulenger, Cat. Liz. Brit. Mus., 2, p. 306, 1885.

IRAQ: Baiji, 1 (28306, W. P. Kennedy).

TRANS-JORDAN: Qasr el Hallabat near Zerka, 1 (11071, Henry Field).

The vivid juvenile pattern is present in the specimen from Qasr el Hallabat. The sandy coloration of the adult, in a typical desert pattern, is well shown in the plate in the "Zoology of Egypt."

Diplometopon zarudnyi Nikolsky.

Diplometopon zarudnyi Nikolsky, Ann. Mus. Zool. Acad. Sci. Petrograd, **10**, p. 277, figs. 1–3, 1907—Nasrie, Arabistan, Iran.

ARABIA: Al Jubail, 70 km. north of Bahrein Island, coast of Persian Gulf, 1 (MVZ No. 25623, R. P. Miller).

This specimen has scattered brown spots on the dorsum. The annuli number 178+17, with 54 segments in an annulus at mid-body. The dorsal and ventral longitudinal grooves are well defined. *Pachycalamus*, to which Boulenger refers *zarudnyi*, lacks the dorsal line, and it seems preferable to retain *Diplometopon* pending a more comprehensive revision of the family. The head shields and preanal plates of the Al Jubail specimen are closely similar to those of the type.

Apathya cappadocica urmiana Lantz and Suchow.

Apathya cappadocica urmiana Lantz and Suchow, Zool. Anz., **106**, p. 294, 1934—west of Lake Urmia (Rizaiyeh).

IRAQ: Aqra, 1 (19745).

This specimen has 60 dorsal scales across the middle of the back, and thus agrees closely with specimens described by Mertens from Mardin (Mertens, 1924, p. 362). Iraq specimens, with dorsal scales 60–68, are thus intermediate between the types of *urmiana*, in which they number 52–57, and the typical form, in which they are 65 75. The presence of eight rows of ventrals apparently ties our specimen directly to the eastern subspecies, though Mertens reports six rows in his specimens from Iraq. The Aqra specimen measures 182.5, tail 122.

Acanthodactylus tristrami iracensis subsp. nov.

Type from Haditha, Iraq. No. 21679 Field Museum of Natural History. Adult male. Collected May 24, 1934, by Henry Field and Richard A. Martin.

Diagnosis.—Distinguished from *tristrami tristrami* and *tristrami orientalis* by larger and fewer dorsal scales, 45–46 across the back instead of 58–65 and 48–56, apparently by a less vivid color pattern, and by the more sharply pectinate toes.

Description of type.—Habitus lacertiform, head and body depressed, shorter than the tail; the length of the head to the posterior border of the parietals contained 4.5 times in the length from snout to anus; a feeble concavity in the anterior border of the frontal; snout pointed, with fairly distinct canthus; nasals feebly swollen; the tip of the fourth toe reaches the ear opening.

Suture between the nasals short; frontonasal a little broader than long; frontal long, narrowed behind; frontoparietals much larger than the interparietal; no occipital; parietals with a raised ridge along their posterior and lateral borders; bordered laterally by a large anterior and a small posterior temporal; two large supraoculars, preceded by a group of three shields on each side representing the first supraocular; six superciliaries, separated from the oculars by a partly double row of granules; two nasals extensively in contact with the upper border of the first labial; anterior loreal much smaller than second; subocular broadly bordering the lip; temporals small, rounded; a small but distinct tympanic shield; auricular denticulation very feeble.

Nuchal scales granular, passing gradually into the larger, smooth, flat, and imbricate dorsals, which number 46 across the body; scales smooth on base of tail; 10 longitudinal and 27 transverse rows of ventrals; the outer rows much narrowed; a median series of five anals; nine scales in the collar; 27 scales from collar to chin shields; five pairs of chin shields, the anterior three in contact; femoral pores 22–22; lamellae beneath the fourth toe 23.

Brown above with obscure light dorsolateral spots, paler beneath; sides of head and neck with vertical dark bars.

Measurements.—Length 135, body 53, head to posterior border of ear 13.5, arm 19, leg 34.

Notes on paratypes.—Nos. 21677, 21678, and 21680, all from the type locality, exhibit no important variation. No. 21677 is a gravid female, measuring 53 mm. from snout to vent, with black vermiculation on the dorsal ground color; the two smaller male specimens have obscure light spots in a dorsolateral row on each side.

Remarks.—The specimens from Papworth's Area, due south of Rutba, recorded below as *Acanthodactylus tristrami orientalis*,

resemble the present form in coloration and in their more elongate snout, and are thus intermediate between *orientalis* and *iracensis*. Presumably the shorter-snouted form from Damesin's Camp, Syria, is typical of *orientalis*.

Acanthodactylus tristrami orientalis Angel.

Acanthodactylus tristrami orientalis Angel, Bull. Inst. Egypte, 18, p. 109, 1936—Palmyra, Tell Abiad, Ain Zahra, and Deir ez Zor.

IRAQ: Papworth's Area (south of Rutba), 2 (19723–4).

SYRIA: Damesin's Camp (northeastern Syria), 4 (19741-4).

These specimens agree with Angel's diagnosis of *orientalis* in having 48 to 51 dorsal scales across the body; they thus reinforce the distinctness of this form from *tristrami*, which has dorsal scales 58–65. There are differences of coloration between our Syrian and Mesopotamian specimens, and in the four specimens from Damesin's Camp the snout is shortened, the labial border of the first upper labial being shorter than that of the second. Obviously much remains to be learned about the distribution of the numerous forms of *Acanthodactylus* in southwestern Asia.

Acanthodactylus boskianus asper Audouin.

Lacerta aspera Audouin, Descr. Egypte, Rept., Suppl., p. 173, pl. 1, fig. 9, 1829—Egypt.

Acanthodactylus boskianus var. *asper* Lataste, Ann. Mus. Genova, (2), 2, p. 496, 1885.

ARABIA: Aden, 4 (18222, A. R. M. Rickards, 1932); Shabwa (Hadhramaut), 1 (18453, A. R. M. Rickards, 1932).

IRAQ: Haditha, 6 (19730); Rutba, 1 (28117).

SYRIA: Between Iraq Petroleum Company's Stations T-1 and T-2, 1 (19704).

The specimen from the Hadhramaut has larger dorsal and especially lateral scales, the laterals and dorsals across the body numbering only 22, with nine between the hind limbs. The Syrian specimen has 36 dorsals, the Rutba specimen 40, and the dorsals vary from 35 to 40 in the Aden series. This variation, however, is matched in Boulenger's much larger series, in which the minimum dorsal scale count of 23 is connected, in south Arabian specimens, with the higher counts.

Two specimens from Haditha have the subocular narrowly bordering the lip on one side only.

Acanthodactylus boskianus euphraticus Boulenger.

Acanthodactylus boskianus var. *euphraticus* Boulenger, Ann. Mag. Nat. Hist., (9), **3**, p. 550, 1919—Ramadi, Iraq.

Acanthodactylus boskianus euphraticus Angel, Bull. Inst. Egypte, **18**, p. 110, 1936.

IRAQ: Tall Afar, 2 (19735 6).

These specimens fall within the limits of variation for this form established by Boulenger and Angel.

Acanthodactylus schreiberi syriacus Boettger.

Acanthodactylus boskianus var. *syriacus* Boettger, Ber. Senck. Ges., **1879–80**, p. 69, 1880– Haifa, Palestine.

Acanthodactylus schreiberi syriacus Wettstein, Sitzber. Akad. Wiss. Wien, (math. natur.), **137**, Abt. I, p. 781.

PALESTINE: Rehovot (Rethoboth), 1 (26882, Georg Haas).

Acanthodactylus robustus Werner.

Acanthodactylus robustus Werner, Zool. Anz., **81**, p. 240, fig. 2, 1929—Bir Molusi (Meloza), Iraq; Schmidt, Field Mus. Nat. Hist., Zool. Ser., **17**, p. 225, 1930.

IRAQ: Jebel Enaze, 1 (11072, Henry Field, 1928).

This specimen has been described in detail in the paper cited above.

Acanthodactylus cantoris arabicus Boulenger.

Acanthodactylus cantoris var. *arabicus* Boulenger, Bull. Soc. Zool. France, **43**, p. 154, 1918—southern Arabia.

Acanthodactylus cantoris arabicus Parker, Ann. Mag. Nat. Hist., (10), **8**, p. 521, 1931.

ARABIA: Adena Sailan, Wadi Beihan, 2 (18456, 18458, A. R. M. Rickards, 1932); Hadhramaut, 1 (18454, A. R. M. Rickards, 1932); Wadi Irma, near Shabwa, western Hadhramaut, 1 (18455, A. R. M. Rickards, 1932); Wadi Sa'ad, between Beihan and Nisab, 1 (18457, A. R. M. Rickards, 1932).

These specimens tend toward *arabicus* in their low number of dorsal scales, but reach a considerably larger size than any reported by Boulenger or Parker. The dorsal scales across the body range from 35 to 40; the length from snout to anus in the single female specimen is 66 mm., two males measuring 68 and two 74.

Ophisops elegans elegans Ménétries.

Ophisops elegans Ménétries, Cat. Rais. Obj. Zool. Voy. Caucase, p. 63, 1832—near Baku, Transcaucasus, U.S.S.R.

Ophisops elegans elegans Lantz, Bull. Mus. Géorgie, Tiflis (Tbilisi), **6**, p. 34, 1931.

IRAN: Darya-i-Namak, 3 (21015); Tehran, 1 (21014).

IRAQ: Balad Sinjar, 2 (19737–8); Diana, 25 (19746); Sulaimaniya, 7 (19747); Tall Afar, 4 (19731–4).

SYRIA: Damesin's Camp, 9 (19740).

TRANS-JORDAN: Moab, 2 (1587, Basel Museum).

The specimens from Diana appear to have somewhat smaller temporal scales than the series from other localities.

Ophisops elegans ehrenbergii Wiegmann.

Amystes ehrenbergii Wiegmann, Arch. Naturg., 1, pt. 2, p. 6, 1835—Syria.

Ophisops elegans ehrenbergii Muller and Wettstein, Sitzber. Akad. Wiss. Wien, 142, Abt. I, p. 142, 1933.

ANATOLIA: Erjias Dagh, 2 (2056, O. H. Tellalina, 1903).

HATAY: Amuq Plain, 1 (25340, C. W. McEwan, 1936).

I venture to retain this subspecies provisionally, though it has been synonymized with the typical form by Lantz (1931, p. 34).

Ophisops elegans schlueteri Boettger.

Ophisops schlueteri Boettger, Ber. Senck. Ges., 1879–80, p. 176, pl. 3, fig. 3, 1880—Cyprus.

CYPRUS: 4 (1855, British Museum).

Boulenger's reference of specimens from Mount Hermon to this subspecies suggests a problem for further study. His use of the concept "variety" and the system of subdivision of species into geographic subspecies in modern practice are often incompatible.

Ophisops blanfordi sp. nov.

Ophisops elegans var. *mizolepis* Boulenger, Monog. Lacert., 2, p. 216, 1921.

Type from Halfaya, 20 miles east of Amara, Iraq. No. 19721 Field Museum of Natural History. Adult male. Collected April 28, 1934, by Henry Field and Richard A. Martin.

Diagnosis.—Distinguished from *Ophisops elegans* by its single postnasal, and small temporal scales.

Description of type.—Habitus lacertiform, snout obtusely pointed, tail twice the length of head and body. Upper head shields smooth; nostril between two large slightly protuberant nasals, with a single postnasal; frontonasal wider than long; prefrontal suture two-thirds the length of the frontonasal; frontal in contact with three supraoculars; three superciliaries on each side, separated from the two large supraoculars by a row of granules; interparietal elongate, as long as the frontoparietals; parietals bordered by two enlarged temporals on each side, the anterior twice as long as the posterior;

four supralabials anterior to the subocular; three shields between the subocular and the auricular which is large; first vertical and lowermost horizontal temporal rows of scales four five; dorsals across back at mid-body 22; ventrals in eight longitudinal (the outer rows much narrowed) and 25 transverse rows; collar attached at middle; 16 gulars from collar to chin shields; a moderately enlarged preanal; femoral pores 10 11. The general color is brownish gray, with obscure light dorsolateral lines, paler beneath.

Measurements.—Total length 144, tail 98, width of head 8, length of shielded part of head 11, arm 17, leg 31.

Notes on paratypes.—The paratypes, all from the lower Tigris-Euphrates Valley (91 specimens, 19716-21, 19876, and 22692), are invariable in having a single postnasal, and 90 of the 91 have the third postsubocular in contact with the auricular. In the specimens referred to *elegans elegans*, eight exhibit this contact on both sides, one has it on one side and not on the other, and in 40 specimens these scales are separated by a lower auricular scale from the enlarged auricular. The dorsal scales, exclusive of the narrow outer row of ventrals, vary from 22 to 28, averaging 25. The temporals are smaller than in *elegans elegans;* the scales in the row between the first post-subocular and the enlarged temporal, number 3 in two, 4 in thirteen, and 5 in five specimens.

Remarks. Malcolm Smith has shown (1935, p. 380) that Stoliczka's name *meizolepis*, based on an Indian specimen, is not applicable to the form in the Tigris-Euphrates Valley, which was referred to *mizolepis* by Boulenger (1921, p. 216). This slightly but constantly distinct form is thus left without a name, which I have supplied above. It is named for W. T. Blanford in allusion to his early recognition of the form (he also confused it with *meizolepis*), and in recognition of his fundamental herpetological work in south-western Asia. Pending demonstration of intergradation with *Ophisops elegans elegans*, I place it as a distinct species.

Eremias guttulata guttulata Lichtenstein.

Lacerta guttulata Lichtenstein, Verz. Doubl. Mus. Berlin, p. 101, 1823—Egypt.

Eremias guttulata guttulata Wettstein, Sitzber. Akad. Wiss. Wien (math.-natur.), 137, Abt. I, p. 782, 1928.

IRAQ: Haditha, 1 (21676).

TRANS-JORDAN: Qasr-el-Burqu', 3 (19727–9, Henry Field, 1928).

This form may readily be distinguished from the Irani (Persian) specimens recorded below as *watsonana* by its more elongate snout.

Eremias guttulata watsonana Stoliczka.

Eremias (Mesalina) watsonana Stoliczka, Proc. Asiatic Soc. Bengal, p. 86, 1872—between Karachi and Sukkur, Sind.

Eremias guttulata watsonana Smith, Fauna Brit. India, Rept. Amph., 2, p. 389, 1935.

IRAN: Isfahan, 7 (21013, 21681); Shah Abdul Azim, 2 (21011 12); Yezd-i-Khast, 33 (21010).

Eremias brevirostris Blanford.

Mesalina brevirostris Blanford, Ann. Mag. Nat. Hist., (4), 14, p. 32, 1874—Kalabagh, Punjab, and Tumb Island, Persian Gulf.

Eremias brevirostris Boulenger, Cat. Liz. Brit. Mus., 3, p. 89, 1887.

IRAQ: Papworth's Area, 2 (19725–6); Rutba, 27 (19722, Field and Martin; 11358, E. S. Fraser).

I take this opportunity to restrict the type locality of this species to Kalabagh, Punjab. Specimen No. 11358 has only two pairs of chin shields in contact. Our specimens do not appear to be *Eremias brevirostris* var. *microlepis* of Angel.

Eremias velox persica Blanford.

Eremias persica Blanford, Ann. Mag. Nat. Hist., (4), 14, p. 370, 1874 near Isfahan, and Rayin, southeast of Kerman.

Eremias velox persica Smith, Fauna Brit. India, Rept. Amph., 2, p. 383, 1935.

IRAN: Yezd-i-Khast, 15 (21009).

Mabuya aurata aurata Linnaeus.

Lacerta aurata Linnaeus, Syst. Nat., p. 209, 1758 Jersea anglorum, Cypro.

Mabuya aurata aurata Mertens, Abh. Ber. Mus. Magdeburg, 3, p. 376, 1924.

IRAQ: Tall Afar, 2 (19690 91).

Mabuya aurata septemtaeniata Reuss.

Euprepis septemtaeniatus Reuss, Mus. Senck., 1, p. 47, pl. 3, fig. 1, 1834 Massowa (Massaua).

Mabuya aurata septemtaeniata Mertens, Abh. Ber. Mus. Magdeburg, 3, p. 377, 1924.

IRAN: Isfahan, 1 (21016).

IRAQ: Amara, 9 (19685–6); Baghdad, 75 (19687, Field and Martin; 25081–25136, Yusuf Lazar); Diyala *Liwa*, 1 (22689, Yusuf Lazar); Halfaya, 2 (19688–89).

The single specimen from Isfahan has 34 scales around the body, and differs in coloration from the Baghdad series in having the belly lineate and the posterior part of the back without pattern.

Mabuya brevicollis Wiegmann.

Euprepis brevicollis Wiegmann, Arch. Naturg., 3, p. 133, 1837—Abyssinia.

Mabuia brevicollis Boulenger, Cat. Liz. Brit. Mus., 3, p. 169, 1887.

ARABIA: Abian Hills, near Lahej, 2 (1859, British Museum); Kureba Wadi Du'an, Hadhramaut, 2 (18461-2, A. R. M. Rickards, 1932).

Mabuya tessellata Anderson.

Mabuia tessellata Anderson, Proc. Zool. Soc. Lond., 1895, p. 636, pl. 36, fig. 2, 1895—(?) near Aden.

ARABIA: Aden, 2 (18223-4, A. R. M. Rickards, 1932).

Mabuya vittata Olivier.

Scincus vittatus Olivier, Voy. Emp. Ottoman, 3, p. 103, 1804—sands west of Rosetta.

Mabuya vittata Wettstein, Sitzber. Akad. Wiss. Wien (math.-natur.), 137, Abt. I, p. 783.

HATAY: Amuq Plain, 2 (25341-2, C. W. McEwan, 1936).

Both specimens have 31 scales around mid-body.

Ablepharus brandtii festae Peracca.

Ablepharus festae Peracca, Boll. Mus. Torino, 9, No. 167, p. 8, 1894—Es-Salt and Dscherasch (Terash), Trans-Jordan.

IRAQ: Baghdad, 1 (28309, W. P. Kennedy, 1937).

Reference to Blanford's account of his *Ablepharus pusillus* from Basra (1876, p. 391, pl. 27, fig. 1) and to Peracca's description of *A. festae* from Trans-Jordan (1894, p. 8), clearly supports the subspecific differentiation of the Mesopotamian form; as in so many other instances, this must be stated as a problem for further investigation. Our specimen agrees with *festae* in having only 18 scales around mid-body, and differs from Blanford's figure of *pusillus* in having a much more elongate body. Boulenger and Proctor have referred specimens from the Euphrates to *brandtii*, with no reference to Peracca's species.

Eumeces schneideri princeps Eichwald.

Euprepis princeps Eichwald, Bull. Soc. Nat. Moscou, 2, p. 303, 1839—Talysch region, Transcaucasus, U.S.S.R.

Eumeces schneideri princeps Mertens, Abh. Ber. Mus. Magdeburg, 3, p. 384, pl. 12, fig. 4, 1924.

HATAY: Amuq Plain, 1 (25355, C. W. McEwan, 1936).

IRAQ: Balad Sinjar, 38 (19636); Rutba, 1 (19633); Tall Afar, 39 (19634-5, 19637-8, 19680).

In spite of the studies on this form by Mertens (1920, 1924, 1924a) and Taylor (1936), the status of *schneideri* and the related forms is far from settled. I am inclined to agree with Taylor in placing the type locality of *schneideri* as "Egypt"; but Mertens' reference of specimens from northern Iraq to the eastern subspecies (whatever its name) is obviously correct.

Whether or not the single specimens from Rutba and from the Amuq Plain belong here is less certain. The series from the Mosul region tends to be completely uniform in dorsal coloration; the Rutba specimen has the bright golden spots familiar in Egyptian specimens. The Hatay specimen differs in having decidedly larger scales on the forearm, four across the arm as viewed from in front instead of five, as in the remaining series. Without specimens of *pavimentatus*, the slender, longitudinally lined form of Syria and Palestine, or Egyptian material, I can offer no further opinion on this question.

In our series twenty-two specimens have the 26 scales around the body and nineteen have 28. The nuchal formula varies from 1–2 to 4–6, as often different on the two sides as alike, the counts 3–4, 4–4, and 4–5 occurring in eight specimens each. Counting the two sides separately, a single nuchal occurs twice, 2 nuchals eight times, 3 twenty times, 4 thirty-six times, 5 eighteen times and 6 twice. Taylor states that the normal scale count in the specimens examined by him is 24; this does not correspond with Anderson's statement that the scales in this species are 26–28 in Egyptian specimens.

Eumeces schneideri variegatus subsp. nov.

Type from Persepolis, Iran. No. 21008 Field Museum of Natural History. Collected August 30, 1934, by Henry Field and Richard A. Martin.

Diagnosis.—Allied to *Eumeces schneideri*, from which it is distinguished by its vermiculate or mottled pattern, and its more numerous nuchals. Distinguished from *Eumeces zarudnyi* in having only four auricular lobules and no lateral line.

Description of type.—Habitus lacertiform; head little broader than neck; limbs moderate, overlapping by the length of the fingers when adpressed; tail slender, longer than head and body. Rostral followed on the upper surface of the head by a pair of supranasals, in contact; a median frontonasal, in contact with the anterior loreal on each side; a pair of large prefrontals, in contact; frontal six-sided, elongate, in contact with three supraoculars on each side; supra-

oculars five; frontoparietals a little smaller than the interparietal, which broadly separates the parietals; nuchals six-six; two loreals behind the rather large nasal; six superciliaries; eight upper and eight lower labials with an additional smaller postlabial above and below; three enlarged temporals, followed by a vertically elongate post-temporal; auricular lobules four on each side; two postmentals, followed by transverse rows composed successively of two, three, five, and eight scales. Twenty-six scales around the body; 66 dorsals to a point opposite the posterior face of the thigh; the two median rows enlarged; median scale row beneath tail enlarged for most of its length; 11 lamellae beneath third finger, 14 beneath fourth toe.

Back brown, with vermiculate darker markings, some of which are arranged in vertical rows, while the mid-dorsal spots tend to form longitudinal lines; under surfaces paler brown.

Measurements.—Total length 205, body 82, tail 123, arm 22, leg 32.5.

Remarks.—While more definitive discrimination of this form depends on the collection and study of additional material, it appears to be well distinguished from its nearest geographic allies, *Eumeces schneideri princeps* and *E. zarudnyi.*

Scincus arabicus sp. nov.

Type from near Shabwa, Hadhramaut, Arabia. No. 18460 Field Museum of Natural History. Collected in 1933 by A. R. M. Rickards.

Diagnosis.—A *Scincus* with thirty scales around the body, rostral broadly in contact with frontonasal, six supraoculars, and poorly developed digital fringes; apparently allied to *Scincus scincus*, from which it is separated by the high number of scales around the body.

Description of type. A stout-bodied *Scincus*, with lateroventral angulation extremely developed; limbs broadly overlapping when adpressed. Rostral strongly produced, with sharp horizontal edge, broadly in contact with the frontonasal; supranasals small, but larger than the very small nasals; a pair of prefrontals, their suture shorter than the frontonasal; frontal expanded anteriorly, narrowed between the supraoculars; six supraoculars; four superciliaries, the anterior longest; frontoparietals separated by the interparietal, which meets the frontal in a point; parietals broken into small transverse scales, three on the left, two on the right; postnasal small, followed by two elongate loreals; four subocular and one postocular; temporals indistinguishable from body scales; eight upper and seven

lower labials; two postmentals, followed by transverse rows of two, three, five, and nine scales; 30 scales around body, 58 dorsals from interparietal to a point opposite posterior face of thigh; two much enlarged preanals; 10 lamellae beneath third finger and 10 beneath fourth toe.

Pale brown above, each scale with a small dark brown spot at its posterior border; uniform yellowish beneath.

Measurements.—Total length 82, body 48, tail 34, arm 14, leg 15.5.

Notes on paratype.—A second specimen, No. 18459, from Wadi Beihan, also collected by the late Wing-Commander Rickards, agrees very closely with the type.

Remarks.—It is unfortunate that no adult specimens are available to make possible a more complete description of *arabicus*.

Scincus conirostris Blanford.

Scincus conirostris Blanford, Proc. Zool. Soc. Lond., **1881**, p. 677, fig. 1, 1881—Tangyak, 7 miles south of Bushire.

IRAQ: Baghdad, 2 (20863, 20865).

The two specimens lack field numbers, and it is impossible to state where, in the environs of Baghdad, they may have been collected. It is not unlikely that geographical races of this wide-ranging form may prove distinguishable.

Chalcides ocellatus ocellatus Forskål.

Lacerta ocellata Forskal, Descr. Anim., p. 13, 1775—Egypt.

Chalcides ocellatus ocellatus Wettstein, Sitzber. Akad. Wiss. Wien (math.-natur.), **137**, Abt. I, p. 784, 1928.

ARABIA: Aden, 2 (18225 26, A. R. M. Rickards).

PALESTINE: Jerusalem, 1 (26884, Georg Haas).

Chalcides sepsoides Audouin.

Scincus sepsoides Audouin, Descr. Egypte, Rept., Suppl., p. 180, pl. 2, figs. 9, 10, 1827—Egypt.

Chalcides sepsoides Flower, Proc. Zool. Soc. Lond., **1933**, p. 790, 1933.

PALESTINE: Jaffa, 1 (26885, Georg Haas).

Chamaeleo chamaeleon chamaeleon Linnaeus.

Lacerta chamaeleon Linnaeus, Syst. Nat., p. 204, 1758—Africa and Asia.

PALESTINE: Jerusalem, 2 (22385–86, Georg Haas).

Chamaeleo calcarifer Peters.

Chamaeleo calcarifer Peters, Monatsber. Akad. Wiss. Berlin, **1870**, p. 110, 1870—Bembatuka, Madagascar (in errore).

ARABIA: Aden, 1 (18201, A. R. M. Rickards).

Chamaeleo calyptratus Duméril.

Chamaeleo calyptratus Duméril, Cat. Méth. Rept., p. 31, 1851.

ARABIA: El Khubar, 1 (1847, British Museum).

SERPENTES

Typhlops vermicularis Merrem.

Typhlops vermicularis Merrem, Tent. Syst. Amphib., p. 158, 1820—Greek Islands (restr. by Mertens and Muller).

HATAY: Amuq Plain, 2 (25336 7, C. W. McEwan).

IRAN: Shah Abdul Azim, 1 (20943).

IRAQ: An Nasiriya, 1 (622730, Yusuf Lazar).

PALESTINE: Benyamina, 1 (28572, Georg Haas).

Leptotyphlops macrorhynchus Jan.

Stenostoma macrorhynchus Jan, Arch. Zool. Anat. Phys., 1, p. 190, 1862—Sennaar.

Leptotyphlops macrorhynchus Corkill, Snakes and Snake Bite in Iraq, p. 8, 1932.

IRAN: Persepolis, 1 (21033, Ernst Herzfeld, 1934).

IRAQ: Baghdad, 2 (26355 6, Yusuf Lazar).

Eryx jaculus jaculus Linnaeus.

Anguis jaculus Linnaeus, Syst. Nat., p. 228, 1758 Egypt.

Eryx jaculus jaculus Zarewsky, Ann. Mus. Zool. Acad. Sci. Petrograd, **20**, p. 375, 1915.

IRAQ: Baghdad, 1 (19498); An Nasiriya, 7 (22723 29, Yusuf Lazar).

PALESTINE: Jordan Valley, 2 (21911 2, P. Y. Shuwayhat).

Eryx jaculus familiaris Eichwald.

Eryx familiaris Eichwald, Zool. spec., Rossiae Polon., **3**, p. 176, 1831.

Eryx jaculus familiaris Zarewsky, Ann. Mus. Zool. Acad. Sci. Petrograd, **20**, p. 376, figs. 8, 9, 1915.

IRAQ: Sulaimaniya, 1 (19624).

The single specimen available from northern Iraq is insufficient material to form an opinion as to the validity of Zarewsky's partition of the species *jaculus*. Rostombekov (1928) carries this partition farther, describing a subspecies *urmianus*, which, if valid, may prove to include the form in northern Iraq.

Natrix tessellata Laurenti.

Coronella tessellata Laurenti, Syn. Rept., p. 87, 1768—Karst region (Ostmark).

Natrix tessellata Bonaparte, Iconogr. Fauna Ital., **2**, fasc. 11, pl., 1834.

IRAN: Isfahan, 4 (20914-15, 20931, 20941); Persepolis, 12 (20899-901, 20916-21, 20925, 20937-38); Shah Abdul Azim, 29 (20902-13, 20942-45, 20951-58); Tehran, 5 (20946-50).

IRAQ: Balad Sinjar, 8 (19594, 19598-99, 19604-7, 19609); Diana, 1 (19622); Halfaya, 58 (19513-70); An Nasiriya, 3 (22720-22, Yusuf Lazar).

PALESTINE: Jordan Valley, 2 (19581, 21908, P. Y. Shuwayhat).

In the Halfaya series the extremes and averages for the number of ventrals and caudals in 25 specimens of each sex are as follows:

	Extremes	Average
Ventrals		
Male	163–178	170.2
Female	162–174	167.4
Caudals		
Male	64–75	69.6
Female	53–70	60.9

The scale counts of 15 males and 12 females from Shah Abdul Azim and Tehran, Iran, are as follows:

	Extremes	Average
Ventrals		
Male	170–181	176.1
Female	168–174	170.7
Caudals		
Male	70–80	74.7
Female	65–71	67.5

These exhibit an increased average number of both caudals and ventrals. The specimens from Persepolis and Isfahan differ from both of the above series. Our specimens are too few to afford conclusive data as to the probable extent of the difference. In nine males and seven females the scale counts are as follows:

	Extremes	Average
Ventrals		
Male	176–183	179.1
Female	173–184	177.4
Caudals		
Male	63–71	67.7
Female	61–67	63.5

These specimens have a higher number of ventrals, in both sexes, than the series from Shah Abdul Azim; but the caudals are fewer and are in better agreement with the Halfaya specimens. The reversal of the relative numbers of ventrals in the sexes is noteworthy.

Coluber jugularis asianus Boettger.

Zamenis viridiflavus var. *asiana* Boettger, Ber. Senck. Ges., **1879–80**, p. 151, 1880.

Coluber jugularis asianus Müller and Wettstein, Sitzber. Akad. Wiss. Wien (math.-natur.), **143**, Abt. I, p. 142, 1933.

IRAN: Shah Abdul Azim (20948).

IRAQ: Amara, 1 (19504); Diana, 2 (19619, 19623); Halfaya, 4 (19511, 19515, 19545, 19567); Zakho, 3 (19612–14).

PALESTINE: Benyamina, 1 (28580, Georg Haas).

Ventrals in the present series range from 194 to 203 in males, and from 199 to 203 in females; caudals from 102 to 114 in males, and from 92 to 107 in females. The total length of the largest specimen (No. 19619, male) is 1,700, tail 465.

I do not find any noteworthy differences between specimens from northeastern Iraq and from the Amara region. The single specimen from Iran has only 92 caudals and has 11 lower labials on each side.

Coluber najadum Eichwald.

Tyria najadum Eichwald, Zool. Spec., Rossiae Polon., 3, p. 174, 1831—Baku, Transcaucasus.

Coluber najadum Mertens and Muller, Abh. Senck. Ges., 41, p. 46, 1928.

IRAQ: Baghdad, 1 (22693); Balad Sinjar, 1 (19603).

PALESTINE: Mount Scopus (near Jerusalem), 1 (28583, Georg Haas); Miqve Yisrael, 1 (28584, Georg Haas).

The four specimens listed above are females; ventrals range from 213 to 225, caudals from 122 to 134; upper labials eight; lower labials 10, except in the Baghdad specimen, which has nine; oculars two–two in all; anterior temporals invariably two; posterior temporals one to three. The Baghdad specimen has more numerous half-bars on the sides of the neck than the remaining specimens.

Coluber rhodorachis Jan.

Zamenis rhodorachis Jan, in De Filippi, Viagg. Pers., p. 356, 1865—Iran.

Coluber rhodorhachis Parker, Ann. Mag. Nat. Hist., (10), 8, p. 516, 1931.

ARABIA: Aden, 1 (18218, A. R. M. Rickards).

IRAQ: Diana, 1 (19618).

The single specimen from Aden, a male, has 19 scale rows; 228 ventrals; 132 caudals; nine upper and 10 lower labials; oculars two–two, and temporals two-two and two three. The female specimen from Iraq has 243 ventrals and 115 caudals; upper labials nine, lower labials 10; oculars one–two; and temporals two–two and two–three.

Coluber rogersi Anderson.

Zamenis rogersi Anderson, Ann. Mag. Nat. Hist., (6), 12, p. 439, 1893—Lower Egypt.

Coluber rogersi Flower, Proc. Zool. Soc. Lond., 1933, p. 810, 1933.

IRAQ: Rutba, 3 (11361, E. S. Fraser; 19508, Field and Martin; 21914, P. S. Manasseh).

SYRIA: Between Homs and Palmyra, 2 (19588, 19592).

These specimens extend the range of *Coluber rogersi* to the north. The ventrals, in the five males, range from 200 to 207, caudals from 88 to 104; the upper labials are uniformly nine; a single preocular in two specimens, 2 in three; postoculars two; temporals 2–2 in three, 2–3 in two; the largest specimen measures 745, tail 200.

Coluber ventromaculatus Gray.

Coluber ventromaculatus Gray, Illus. Indian Zool., 2, pl. 80, fig. 1, 1834—Bengal.

ARABIA: Al Jubail (70 miles north of Bahrein Island), 1 (MVZ 25624).

IRAN: Yezd-i-Khast, 1 (20939).

IRAQ: Baghdad, 12 (19494-95, 19501, 19505–7, Field and Martin; 22695, 26357–58, 28316–18, Yusuf Lazar); Kish, 2 (11064–65, Henry Field); An Nasiriya, 23 (22696–717, Yusuf Lazar).

No differences are discernible in the Arabian and Persian specimens. The series is uniform in coloration and in scale characters. Ventrals vary in eleven males from 196 to 217, caudals in eight males from 97 to 112; in six females the ventrals range from 210 to 222, and caudals from 93 to 104.

Lytorhynchus diadema Duméril and Bibron.

Heterodon diadema Duméril and Bibron, Erp. Gén., 7, p. 779, 1834—Algeria.

Lytorhynchus diadema Peters, Monatsber. Akad. Wiss. Berlin, 1862, p. 272, pl., fig. 1, 1862.

IRAQ: Baghdad, 1 (20859).

The single specimen available is a female with dorsal scales 21–19–15, ventrals 192, anal divided, caudals 44, upper labials eight, lower labials 11, oculars two–two, temporals two -three and two-four; the total length (with tip of tail wanting) is 450, tail 60. The darker dorsal blotches, 34 on the body and eight on the tail, are about as long as the lighter interspaces.

Were it not that this form, like so many others in southwestern Asia, is in need of comprehensive taxonomic study, I should be inclined to refer the Baghdad specimen to *Lytorhynchus gaddi* Nikolsky, from Iran.

Lytorhynchus kennedyi sp. nov.

Type from between Homs and Palmyra, Syria. No. 19586 Field Museum of Natural History. Adult male. Collected May 21, 1934, by Henry Field and Richard A. Martin.

Diagnosis. Allied to *L. diadema*, but with widely spaced black dorsal crossbars; preoculars three on each side; 10 lower labials.

Description of type. Relatively short and stout-bodied for *Lytorhynchus*, head short and eye large; rostral enlarged with vertical projecting lateral edges, projecting backwards so that the internasal suture is very short, one-third that of the prefrontals; frontal five-sided, as long as its distance from the end of the snout; parietals large, extending downward at the anterior border to a point opposite the middle of the eye; nasal large, divided, nostril nearer its upper border; a small quadrangular loreal, as long as high, upper labials seven-eight; lower labials 10 10; preoculars three three; postoculars two three; temporals two two on each side; dorsal scales smooth, 21 19 13; ventrals 166; anal divided; caudals 35.

Pale yellowish gray above, with 22 black crossbars on the body and eight on the tail. The crossbars, extending to the first or second scale row, cover one and one-half to two dorsal scales, the interspaces six or seven; small black spots are present on the first and second scale row on each side midway between the transverse bars; ventrals entirely without markings; head marked with a transverse black mark from eye to eye, connecting with a longitudinal mark on the frontal and on the parietal suture, continuing and broadening on the neck for the length of eight scales, and eight scales wide posteriorly.

Measurements. Total length 380, tail 55.

Remarks. The distinctive coloration described above is shown in the plate of *L. diadema* in *Snakes and Snake Bite in Iraq* (Corkill, 1932, pl. 10). It may be pointed out that the difference between *kennedyi* and *diadema* corresponds closely to that between *Phyllorhynchus browni* and *P. decurtatus* of the Arizonan deserts on the opposite side of the world. *Phyllorhynchus* closely parallels *Lytorhynchus* in its modified rostral shield. The new form bears the name of Dr. Walter P. Kennedy, of the Royal College of Medicine, Baghdad, who has contributed important material to our collections.

Elaphe nummifera Reuss.

Coluber nummifer Reuss, Mus. Senck., 1, p. 135, 1834 -Egypt.

PALESTINE: Jordan Valley, 1 (21913, P. Y. Shuwayhat); Kefar Jehoshua (east of Haifa), 1 (28581, Georg Haas).

Both specimens are females; the dorsal scales are 23 23-17, ventrals 211 and 215, anal divided, caudals 85 and 79, upper labials nine, lower labials 10 10 and 10 11, oculars two two and two-three, temporals one-three and two three in one, two-three on each side in the other.

Elaphe ravergieri Ménétries.

Coluber ravergieri Ménétries, Cat. Rais. Obj. Zool. Voy. Caucase, p. 69, 1832—Georgia.

IRAQ: Diana, 1 (19621); Zakho, 2 (19616–17).

The Diana specimen is incomplete, but has the dorsal scales in 23 rows in agreement with the two from Zakho. Of these, the male has ventrals 207, caudals 101, upper labials nine, lower labials 11, oculars two–two, and temporals two–three; the female has 220 ventrals, tail imperfect, upper labials nine, lower labials 10, oculars three–two, and temporals two–two. The Diana specimen measures 1,255, tail 310.

Elaphe caudaelineata Günther.

Zamenis caudaelineatus Günther, Cat. Colubrine Snakes Brit. Mus., p. 104, 1858—Shiraz, Iran.

IRAN: Persepolis, 4 (20922, 20924, 20926, 20936, Ernst Herzfeld).

The four specimens from Persepolis are entirely distinct from the specimens of *ravergieri* discussed above. The dorsal scale formula is 21–21–15 instead of 23 or 25–23–17. Ventrals and caudals in the single male, 193 and 101; in three females 201–213 and 87–93. The lineate pattern of the tail is distinctive. The largest specimen, a female, measures 855, tail 195.

Spalerosophis microlepis Jan.

Spalerosophis microlepis Jan, in De Filippi, Viagg. Pers., p. 356, 1865—Laristan and Shiraz (here restricted to Laristan).

IRAN: Persepolis, 2 (20923, 20929, Ernst Herzfeld).

The two specimens, both male, are in close agreement. Both have the dorsal scale formula 37–43–23; the ventrals are 240 and 241; anal undivided; caudals 101 in No. 20929, with a complete tail; upper labials 14–15 in both; lower labials 16–14 in one, 15–15 in the other; scales about eye 13 in one, 12 in the other; temporals seven–seven and six–eight. No. 20929 measures 1,005 in total length, tail 270.

Spalerosophis schirazianus Jan.

Periops parallelus var. *schiraziana* Jan, in De Filippi, Viagg. Pers., p. 365, 1865 Shiraz.

IRAN: Shah Abdul Azim, 9 (20908, 20912 13, 20951, 20960 62); Tehran, 3 (20894, 20908, 20959).

In the present series of six specimens of each sex, the dorsals at mid-body are 25 in two, 27 in eight, and 29 in two; ventrals in males 224 237; in females 236 245; caudals in five males 80--89; in five females 80-87. The upper labial count 12 occurs twelve times, 13 eleven times, and 14 once; lower labials 13 or 14; ocular ring composed of six to 10 scales; anterior temporals three–five, those of second row four to six. The largest specimen, a female, measures 1,222, tail 215.

The species is well distinguished from the so-called *diadema* of Iraq, but may be more closely allied to the true *diadema* (of northwestern India). Trinomial designation is reserved for further study.

Spalerosophis cliffordii Schlegel.

Coluber cliffordii Schlegel, Physion. Serp., 2, p. 163, 1837--Tripoli.

IRAQ: Baghdad, 4 (19580, 20857, Field and Martin; 28314–15, Yusuf Lazar); Balad Sinjar, 1 (19596); Halfaya, 1 (19625); Kish (Tell el Uhaimir), 2 (11066 67, Henry Field); An Nasiriya, 2 (22718–19, Yusuf Lazar).

The reference of specimens from Iraq to *cliffordii* instead of to *diadema* auct. is made necessary by the recognition of *schirazianus* from Iran, inserted between the type locality of *diadema* (Bombay), and the Iraqi (Mesopotamian) area. It is by no means a completely satisfactory allocation. The alternative is to give a new name to the form in the Euphrates Valley, and it is preferable to reserve the proposal of additional names for a more comprehensive revision, pending which trinomials are avoided. It seems clear that *Spalerosophis* is more nearly allied to *Elaphe* than to *Coluber*.

Rhynchocalamus arabicus Schmidt.

Rhynchocalamus arabicus Schmidt, Field Mus. Nat. Hist., Zool. Ser., 20, pp. 9 10, 1933 Aden.

ARABIA: Aden, 1 (18219, A. R. M. Rickards).

Additional material of this species is much to be desired.

Rhynchocalamus melanocephalus Jan.

Homalosoma melanocephalum Jan, Arch. Zool. Anat. Phys., 2, p. 34, 1862—Beirut.

Rhynchocalamus melanocephalus Günther, Zool. Rec., 2, p. 152, 1865.

PALESTINE: Jaffa, 1 (26890, Georg Haas); Jerusalem, 1 (28575, Georg Haas).

The two specimens at hand differ notably in the development of the rostral, which separates the internasals in the specimen from Jaffa, and fails to do so in the one from Jerusalem. The probability that the development of the rostral is associated with burrowing habits suggests that this difference may have a geographic or ecological correlation. Ventrals in the Jaffa specimen, a female, number 222, caudals 60; the specimen from Jerusalem, a male, has ventrals 195, caudals 60; a loreal is present in both.

Eirenis collaris Ménétries.

Coluber collaris Ménétries, Cat. Rais. Obj. Zool. Voy. Caucase, p. 67, 1832—Bechemerbak, near Caspian Sea.

Eirenis collaris Jan, Arch. Zool. Anat. Phys., 2, p. 257, 1863.

IRAQ: Baghdad, 1 (20858); Tall Afar, 1 (19626).

PALESTINE: Jordan Valley, 1 (21910, P. Y. Shuwayhat).

The two from Iraq, both male, have ventrals 184 and 196, and caudals 60. The ventrals and caudals are 187 and 60 in the single female from Palestine. The latter has a very small loreal, absent in the two former.

Eirenis coronella coronella Schlegel.

Calamaria coronella Schlegel, Physion. Serp., 2, p. 48, 1837—Moorea and Syria (here restricted to Syria).

Eirenis coronella Barbour, Proc. New Engl. Zool. Club, 5, p. 89 (cited for combination only).

SYRIA: Homs, 1 (19593); between Homs and Palmyra, 3 (19585, 19590–91).

TRANS-JORDAN: Jebel el Ashaqif, 1 (19582); Mafraq, 1 (19577).

The series above listed exhibits little variation, and appears to represent a well-defined form. The dorsal scales are 17 on the neck (only as far as the sixth ventral), 15 at mid-body, and reduce to 13 anterior to the anus. Ventrals in three males 126, 130, 131, in four females 143, 146, 149, 151; caudals in males 39, 39, and 48, in females 37, 42, 42, and 45; upper labials uniformly 7–7, lower labials 8 8 in five, 8–7 in one, 7–7 in one; oculars 1–2 in five, preocular single on one side in one, postocular single on one side in another; temporals 1–1; length of largest male 255, tail 55; of largest female 295, tail 55. All are plainly banded.

I regard Jan's *Eirenis fasciatus* from Lake Tiberias as probably identical with this form. Boulenger's *coronella* does not seem to

correspond to *coronella* of Schlegel at all (cf. *Eirenis lineomaculata*, below). Barbour's series of *Eirenis* from Petra and Mount Sinai (Barbour, 1914, p. 89) have 15 dorsal scale rows, but the ventrals range from 140 to 158 (not sexed). The difficulties in allocating specimens correctly to this species emphasize the necessity for a revision of the genus.

Eirenis coronella fraseri subsp. nov.

Type from Rutba, Iraq. No. 11364 Field Museum of Natural History. Adult male. Collected, 1930, by E. S. Fraser.

Diagnosis.—An *Eirenis* with a short body and broad head, with 15 scale rows, distinguished from *Eirenis coronella* by distinctly higher number of ventrals in both sexes and by the obscurity of the transverse bands and nuchal collar.

Description of type.—A stout-bodied small snake with head distinctly widened in temporal region. Portion of rostral seen from above about as long as the internasal suture, which is a little shorter than the prefrontal suture; frontal as long as its distance from the tip of the snout, shorter than the parietals; nasal single, a small loreal; preocular single; seven upper and eight lower labials; two postoculars; temporals one one; anterior chin shields much larger than the posterior, which are scarcely distinguishable from the adjacent scales; dorsals smooth, 15 15 13; ventrals 141; anal divided; caudals 36 (tail incomplete).

Pale yellowish brown above, lighter beneath, with extremely obscure darker transverse bands above.

Measurements. Body length 231, tail (incomplete) 49.

Notes on paratypes. Four additional specimens from Rutba, also collected by E. S. Fraser, one from Papworth's Area, 25 miles south of Rutba, collected by Henry Field and Richard A. Martin, and two (from the same collectors) from between Homs and Palmyra, Syria, are available as paratypes. The difference between this series and what I have interpreted as true *coronella* is evident when the scale counts are assorted to sex:

	c. coronella	*c. fraseri*
Ventrals		
Male.	126–131	139–146
Female	143–151	152–158

The number of specimens available is too small for more definitive characterization of the forms in question. I should be inclined to identify *fraseri* with *modesta* (Martin, 1838, p. 82), but for the description of the head coloration, which corresponds to that of

collaris, and the complication of Boulenger's assignment of this name to a form with 17 scale rows (1920, p. 348). The new form is named for E. S. Fraser, of the Nairn Overland Transport Company, at Rutba.

Eirenis decemlineata Duméril and Bibron.

Ablabes decemlineatus Duméril and Bibron, Erp. Gén., 7, p. 327, 1854 no locality.

Eirenis decemlineatus Muller, Verh. Naturf. Ges. Basel, 6, p. 595, 1878.

PALESTINE: Between Jaffa and Haifa, 2 (26886 87, Georg Haas).

The male specimen, No. 26887, is without dark lines, while the female, No. 26886, is lineate. The dorsals are 17–17 15 in both, and both have upper labials seven, lower labials eight, oculars one–two, and temporals one–two. The ventrals and caudals in the male are 168 and 82; in the female 169 and 70.

Eirenis rothi Jan.

Eirenis rothi Jan, Arch. Zool. Anat. Phys., 2, p. 259, 1863—Jerusalem.

PALESTINE: Kafr Juri, 7 miles north of Jerusalem, 1 (26888, Georg Haas).

The single male has dorsal scales 15-15-15, ventrals 166, anal divided, caudals 50, upper and lower labials seven, oculars one two, temporals one–one, and a small loreal on each side. Total length 295, tail 57.

Eirenis lineomaculata sp. nov.

Type from Jordan Valley, Palestine. No. 21909 Field Museum of Natural History. Adult male. Collected, 1934, by P. Y. Shuwayhat.

Diagnosis.— Distinguished from *Eirenis coronella* by having seventeen scale rows, a lower number of ventrals, no loreal, and dorsal spots arranged as alternate longitudinal dashes.

Description of type.— A stout-bodied snake with neck as wide as head, head pointed, and rostral moderately developed. Portion of rostral seen from above longer than the internasal suture, which is about half as long as that between the prefrontals; frontal longer than its distance from the tip of the snout, nearly as long as the parietals; nasal undivided, elongate, in contact with the single preocular; no loreal; upper labials seven–seven; lower labials eight eight; two postoculars on each side; temporals one–two on each side; dorsal scales smooth, 17–17–15; ventrals 119; anal divided; caudals 38.

Pale brown above, lighter uniform yellowish brown below; back with four rows of dark brown spots, those of the median rows strongest, with a tendency to be juxtaposed anteriorly, becoming

alternate posteriorly; each of the scales involved in these spots, viewed under a magnifier, is seen to have a light median shaft bordered by dark pigment stronger than in the remainder of the spot, producing a sharply lineate appearance; a well-marked nuchal collar extends obliquely forward to the first ventral, narrowing below and not closed on the throat; a dark subocular spot on the second to fourth labials is matched by a smaller one on the third and fourth lower labials; obscure dark markings on the head shields; sixth upper labial, first temporal, upper second temporal, and adjacent border of parietal dark-bordered.

Measurements. - Total length 217, tail 45.

Notes on paratype.—A single specimen, No. 25335, collected by C. W. McEwan in the Amuq Plain, Hatay, agrees with the type in coloration and other essential characters. A female, with 118 ventrals and 22 caudals.

Remarks. Our material is inadequate for the solution of the taxonomic problems in *Eirenis;* the present form agrees closely with the Palestinian series described by Boulenger (1894, p. 264) under the name *coronella.*

Eirenis iranica sp. nov.

Type from Tirak Mart Mountains, near Shah Abdul Azim, Iran. No. 20950 Field Museum of Natural History. Adult male. Collected September 6, 1934, by Henry Field and Richard A. Martin.

Diagnosis.- -Distinguished from *Eirenis condoni* by fewer ventrals and the absence of a loreal, and from *E. brevicauda* by the longer tail and scales in 17 rows.

Description of type. A stout-bodied snake with head slightly wider than neck; snout pointed; rostral scarcely visible from above; internasals about as long as prefrontals; frontal with a straight anterior border, as long as the parietal suture; nasal undivided, elongate, extending to the preocular, in contact with the first two labials; the single preocular widely separated from the frontal; two postoculars; temporals one two on each side; parietal extending downward on the sides, making a contact with the lower postocular; anterior chin shields longer than posterior; dorsal scales smooth, 17–17-15; ventrals 159; anal divided; caudals 76.

Grayish brown above, paler beneath, without markings, except for irregular small dark spots on the sides of the neck and dark margins on the upper and lower labials.

Measurements.—Total length 398, tail 104.

Remarks.—The species appears to be well distinguished from *Eirenis condoni* from Shiraz, which has ventrals 169-173, and from *E. brevicauda*, which has the dorsal scales in 15 rows and caudals only 38-41. Nikolsky's species *Eirenis bicolor*, from eastern Iran, has 15 scale rows and 202 ventrals; and his *E. transcaspica* is excluded from *iranica* by the same characters. Boulenger has revived the name *modesta* of Martin (type locality, Euphrates Valley) for the specimens with 17 scale rows which he had formerly referred to *collaris;* but since Martin's description specifically mentions the characteristic head coloration of *collaris*, I am inclined to interpret *modesta* as a strict synonym of *collaris*. The present form appears to be excluded from *modesta* in any case, by the absence of a loreal.

It may be repeated, as is obvious from the list of species above, that the genus *Eirenis* requires comprehensive revision in the light of modern geographic taxonomy.

Tarbophis fallax mcewani subsp. nov.

Type from Amuq Plain, Hatay (formerly *Sanjak* of Alexandretta). No. 25330 Field Museum of Natural History. Adult male. Collected in 1936 by C. W. McEwan.

Diagnosis.—A subspecies of *Tarbophis fallax*, distinguished from *fallax fallax* by its longer tail and fewer dorsal spots; from *syriacus* by the longer tail, greater number of ventrals, and larger number of dorsal spots; and from *fallax iberus* by its divided anal and lower number of ventrals.

Description of type.—Head distinct from neck, snout bluntly pointed, body moderately slender. Rostral little visible from above; internasals smaller than prefrontals; frontal subtriangular, as long as its distance from the end of the snout; nasal rectangular, semi-divided; loreal elongate, narrowly entering the eye below the preocular; the single preocular broadly in contact with the frontal; two postoculars; parietals rather small; temporals two three-four on each side; upper labials seven-eight; lower labials ten ten; dorsal scales 19–19–15, smooth; ventrals 195; anal divided; caudals 67.

Pale brown above, with about 34 dark mid-dorsal blotches which tend to be connected on the sides with vertical or oblique narrower lines extending to the dark venter; chin light; top of head uniform glossy brown; dark nuchal band six scales behind parietals, seven scales long; dark dorsal spots two or three scales long.

Measurements of type.—Total length 610, tail 105.

Notes on paratypes.—In two additional males (25331–32) and two females (25328–29) from the type locality, all collected by Dr.

McEwan, the ventrals are respectively 200, 197, 200, and 197, and the caudals 72, 63, 65, and 59. The scaling of the head is uniform. The dorsal spots range from 30 to 36.

Remarks. – Boulenger's list of specimens of *fallax* (1896, Cat. Snakes Brit. Mus., 3, p. 49) includes one from Xanthus which may belong with the present form, judging from its high number of caudals. If this guess should prove correct, *Tarbophis fallax mcewani* is to be expected from intermediate localities, and must be thought of as intervening between *T. f. fallax* of the Balkan Peninsula and *T. f. iberus* of the Caucasus. Boulenger's figures for caudals in eight Dalmatian specimens range from 48 to 55. The new form is named for Dr. Calvin W. McEwan, of the Oriental Institute, University of Chicago, whose efforts added the important collection from the Amuq Plain to our material.

Tarbophis fallax syriacus Boettger.

Tarbophis vivax f. *syriaca* Boettger, Ber. Senck Ges., 1879–80, p. 166, 1880—Jaffa.

Tarbophis fallax syriacus Mertens, Senckenbergiana, 6, p. 184, 1924.

PALESTINE: Kiriath Anawim, 1 (28585, Georg Haas); Rehovot (Rethoboth), 1 (28586, Georg Haas).

SYRIA: Chouit Araya (12 km. from Beirut), 1 (28304, Yusuf Lazar).

The two Palestinian specimens, both females, agree in having 185 ventrals, eight upper and 10 lower labials, temporals two–four, and 19 dorsal scale rows. No. 28585, with a complete tail, has 65 caudals. The number of dorsal spots is 24 and 26 on the body. These specimens obviously agree with Boulenger's *Tarbophis savignyi*, which Mertens has correctly referred to *Tarbophis fallax syriacus*. Barbour and Amaral, regarding Boettger's *syriacus* as composite, restrict the type locality to "Southern Syria and adjacent Lower Egypt"; but Mertens (1922, p. 181) cites only a single type, with the unequivocal type locality Jaffa.

Tarbophus fallax iberus Eichwald.

Trigonophis iberus Eichwald, Zool. Spec., Rossiae Polon, 3, p. 175, 1831—Tiflis.

Tarbophis fallax iberus Mertens and Muller, Abh. Senck. Ges., 41, p. 50, 1928.

IRAN: Shamar Mountains, near Shah Abdul Azim, 1 (20956); Tehran, 2 (20968, 20970).

In No. 20968, a female from Tehran, the dorsals are in 19 rows, ventrals 218, anal entire, caudals 69, upper labials eight–eight, lower labials 11–11, oculars one–two, temporals three–three and three-four, total length 220, tail 39.

The specimen from the Shamar Mountains is a male with dorsals 19, ventrals 216, anal entire, caudals 65, upper labials eight-eight, lower labials 11–10, oculars one two, and temporals two five. It measures 601, tail 103.

The specimens obviously agree most closely with *iberus*.

Tarbophis nigriceps Ahl.

Tarbophis nigriceps Ahl, Arch. Naturg., **90**, Abt. A, Heft 5, p. 246, 1924—central Mesopotamia.

IRAQ: Rutba, 1 (11367, E. S. Fraser).

The single female is noteworthy for its coal black belly and black head. The dorsal scale formula is 19–19–15; ventrals 187; anal divided; caudals 55; upper labials nine-nine; lower labials 10-10; oculars one-two; temporals two-two; and total length 380, tail 65. The number of dorsal dark bands is 18 on the body, five on the tail.

The agreement in coloration with Ahl's description is striking, and I have little hesitation in regarding the species as fully distinct. It agrees most closely in scale characters with *Tarbophis fallax syriacus* of Palestine.

Tarbophis martini sp. nov.

Type from Baghdad, Iraq. No. 28319 Field Museum of Natural History. Adult female. Collected in 1937 by Yusuf Lazar.

Diagnosis.—A *Tarbophis* similar to the *fallax* formenkreis in coloration, distinguished by having the dorsal scales uniformly in 21 rows and by a greater number of ventrals; the loreal enters the eye, and the anal may be entire or divided.

Description of type.—Head very large in the temporal region, body stout, tail slender; rostral scarcely visible from above, internasals smaller than prefrontals; frontal subtriangular, the anterior angles truncate at their contacts with the preoculars, shorter than its distance from the tip of the snout; parietals relatively small; nasal rectangular, semidivided; loreal elongate, entering the eye; a single preocular; two postoculars; temporals two–four–four and three-five–five; upper labials eight–seven; lower labials 10-11; dorsal scales 21–21–15, smooth; ventrals 235; anal divided; caudals 67.

Pale brown above, with about 39 darker brown mid-dorsal blotches, irregularly connected with vertical or oblique narrow bars on the sides; belly dark, chin white.

Measurements of type.—Total length 876, tail 136.

Notes on paratypes.—A considerable series, all from Baghdad (several collected by Yusuf Lazar near Dr. Kennedy's house), attests the uniformity in scale characters of *Tarbophis martini*. Nos. 19493, 19497, and 19499 500 were collected by Henry Field and Richard A. Martin, Nos. 22694, 26348-49, and 28303 by Yusuf Lazar. All have 21 scale rows at mid-body. In two males the ventrals are 226 and 232 and the anal is single; caudals 74 and 67. In six females the ventrals range from 226 to 242; the anal is single in one, divided in five; caudals 65–72.

Remarks.—This is the Iraqi form referred to *iberus* by various authors; it is well distinguished from that form by its higher number of dorsal scales, and more frequently divided anal. It is readily distinguishable from *Tarbophis cyprianus,* which also has 21 dorsals, by its much higher number of ventrals. There is at present no evidence of intergradation between these 21-rowed forms and the 19-rowed *fallax* series. The new form is named in honor of Richard A. Martin, Curator of Near Eastern Archaeology in Field Museum.

Tarbophis guentheri Anderson.

Tarbophis guentheri Anderson, Proc. Zool. Soc. Lond., 1895, p. 656, pl. 36, fig. 3, 1895—Aden and the Hadhramaut.

ARABIA: Aden, 1 (18216, A. R. M. Rickards).

The single female has dorsal scales 21–21–13; ventrals 226; anal entire; caudals 70; upper labials nine; lower labials 12; oculars one–two; temporals two–three; total length 807, tail 146.

Tarbophis rhinopoma Blanford.

Dipsas rhinopoma Blanford, Ann. Mag. Nat. Hist., (4), 14, p. 34, 1874—Kamán, Iran.

Tarbophis rhinopoma Boettger, in Radde, Fauna Flora Caspi-Gebietes, p. 72, 1886.

IRAN: Persepolis, 1 (20928, Ernst Herzfeld).

The juvenile specimen is a female; dorsal scales 21–23–17; ventrals 251; anal entire; tail incomplete; upper labials 10–9; lower labials 12; oculars two-three; temporals four–four and five–four.

Malpolon monspessulana insignitus Geoffroy.

Coluber insignitus Geoffroy, Descr. Egypte, Hist. Nat., 1, p. 151, 1827—Lower Egypt.

Malpolon monspessulana insignitus Mertens and Muller, Abh. Senck. Ges., 41, p. 51, 1928.

IRAN: Shah Abdul Azim, 1 (20963).

IRAQ: Diana, 1 (19620); Zakho, 3 (19610–11, 19615).

PALESTINE: Tel Aviv, 1 (28576, Georg Haas).

TRANS-JORDAN: Mafraq, 1 (19578).

The six specimens examined are remarkably uniform in scale characters. One has 19 scale rows at mid-body, reducing to 15; four have the scale formula 17-15; and one reduces to 17 15 13. Ventrals in two males are 168 and 174; in four females 174, 175, 175, and 179; caudals in males 77 and 86, and in females 74, 79, 87, and 89. There is little, if any, difference between the sexes in these characters.

Malpolon moilensis Reuss.

Coluber moilensis Reuss, Mus. Senck., 1, p. 142, pl. 7, fig. 1, 1834—Moilah, Arabia.

Malpolon moilensis Parker, Ann. Mag. Nat. Hist., (10), 8, p. 522, 1931.

IRAQ: Baghdad, 3 (20860–62).

The three females available are remarkably uniform in scale characters. All have dorsal scales 17–17–13; ventrals 167; and upper labials eight–eight. The caudals are 55, 55, and 57; lower labials 11–11 in two, 11–10 in one; oculars one–two in two, one-three on one side and two–two on the other side in the third; temporals two-three in two, two–four in the third.

Taphrometopon lineolatum Brandt.

Coluber (Taphrometopon) lineolatum Brandt, Bull. Acad. Sci. St. Pétersbourg, 3, p. 243, 1838—Caspian coast.

Taphrometopon lineolatum Peters, Proc. Zool. Soc. Lond., 1861, p. 48, fig., 1861.

IRAN: Tehran, 1 (20971); Yezd-i-Khast, 1 (20940).

The specimen from Yezd-i-Khast is a male, measuring 540, tail 120, with dorsals 17-17-13, ventrals 174, anal divided, caudals 75, upper labials nine–nine, lower labials 11-11, oculars one–two, and temporals two-three. The female from Tehran measures 535, tail 129, and differs only in having ventrals 175 and caudals 83.

Psamophis schokari Forskål.

Coluber schokari Forskål, Descr. Anim., p. 14, 1775—Yemen.

Psammophis schokari Boulenger, Cat. Snakes Brit. Mus., 3, p. 157, 1896.

ARABIA: Aden, 1 (18217, A. R. M. Rickards).

IRAN: Persepolis, 1 (20934, Ernst Herzfeld).

IRAQ: Amara, 1 (19574); Rutba, 1 (19509).

PALESTINE: Tel Aviv, 1 (28582, Georg Haas).

Psammophis schokari, with its vast geographic range, from Senegal to Sind, exhibits a great amount of variation in scale characters and coloration, and will repay a detailed study, even though its great

powers of active locomotion and association with habitat conditions relatively recently established afford less expectation of partition into subspecies than in less vagile forms. The specimens here listed fall within the limits of ventrals and caudals in Boulenger's list.

Hydrophis cyanocinctus Daudin.

Hydrophis cyanocinctus Daudin, Hist. Nat. Rept., 7, p. 383, 1803—Coromandel.

ARABIA: Bahrein Island, 2 (28310-11, W. P. Kennedy).

The two specimens differ conspicuously in coloration, the bands in one encircling the body, while in the second they are confluent dorsally and ventrally and irregular on the sides. The ventrals number about 330, the dorsals 30-40 40.

Vipera lebetina euphratica Martin.

Vipera euphratica Martin, Proc. Zool. Soc. Lond., 1838, p. 82, 1838 -Euphrates Valley.

IRAQ: Balad Sinjar, 5 (19595, 19597, 19600 2).

The fine series of specimens collected by Dr. Field and Mr. Martin is uniform in scale characters. The ventrals in the two males are 174 and 177; in three females 169, 172, 174; caudals in males 44 and 47; in females 40, 44, and 44; upper labials 10 or 11; lower labials 13 or 14; the largest specimen measures 1,270, tail 150.

With no other available material of *Vipera lebetina* in the broad sense, no opinion is offered on the further partition of this form. The trinomial is used in view of the restriction of *Vipera lebetina lebetina* to Cyprus and Milos by Mertens and Müller (1928, p. 52).

Vipera palaestinae Werner.

Vipera palaestinae Werner, Zool. Anz., 122, p. 313, figs. 3, 4, 1938—Haifa, Palestine.

PALESTINE: Ain Harod, 1 (28579, Georg Haas).

The single male specimen available agrees best with Werner's description of *Vipera palaestinae;* I can offer no further comment on Werner's partition of the *lebetina* group, which fails to define *euphratica*. Our specimen has 161 ventrals, anal entire, 38 caudals, upper labials 10 10, lower labials 11 12, scales between oculars five, scales around eye (exclusive of supraocular) 11-12.

Pseudocerastes fieldi Schmidt.

Pseudocerastes fieldi Schmidt, Field Mus. Nat. Hist., Zool. Ser., 17, p. 227, pl. 2, text fig. 2, 1930—Bair Wells, Trans-Jordan; Flower, Ann. Mag. Nat. Hist., (10), 6, p. 224, 1930.

IRAQ: Rutba, 2 (19834).

TRANS-JORDAN: Bair Wells, 2 (11061-62, Henry Field); Um Wu'al 1 (11063, Henry Field).

In addition to the type (11061) and two paratypes collected by Dr. Field on his expedition of 1928, we have received one complete and one fragmentary specimen of this species from Rutba. The complete specimen, a female, has dorsal scales 21-23-17; ventrals 136; caudals 36; upper labials 12 12; lower labials 16 15; total length 720, tail 85.

It seems evident that *Pseudocerastes fieldi* is quite as likely to be the Biblical adder (Hebrew *shephiphon*) of Genesis xlix:17 as *Aspis cerastes* (*Cerastes cornutus* auct.), as supposed by Tristram (Nat. Hist. Bible, ed. 3, p. 273, 1872). I find no recent record (of specimens collected) of *cerastes* for Palestine, though Flower lists it from both Palestine and Trans-Jordan (1933, p. 830). Bodenheimer's reference to this species (1935, p. 190) distinguishes it from *Aspis cerastes* with the supposition that *fieldi* has "only one horn between the eyes," which is quite erroneous. It may well prove that *P. fieldi* has been much confused with the horned *Aspis*.

Pseudocerastes persicus Duméril and Bibron.

Cerastes persicus Duméril and Bibron, Erp. Gén., 7, p. 1443, pl. 78b, fig. 5, 1854—Persia.

Pseudocerastes persicus Boulenger, Cat. Snakes Brit. Mus., 3, p. 501, 1896.

IRAN: Aminabad, 1 (20933).

The single specimen is much damaged. The dorsal scale rows are 23; caudals 48; upper labials 13; lower labials 15; scales about eye, 17.

Aspis cerastes Linnaeus.

Coluber cerastes Linnaeus, Syst. Nat., p. 217, 1758 "Oriente"; here restricted to southern Judaea.

ARABIA: Al Jubail, 70 km. north of Bahrein Island, 1 (MVZ, R. P. Miller).

A single badly mangled specimen, without horns.

Echis carinatus Schneider.

Pseudoboa carinata Schneider, Hist. Amphib., 2, p. 285, 1801—India.

Echis carinata Wagler, Syst. Amphib., p. 177, 1830.

IRAN: Persepolis, 1 (20927, Ernst Herzfeld).

The specimen is a juvenile female, measuring only 200 mm., tail 23; the dorsal scales are 27–35–21; belly injured; caudals 32; upper labials 11–11; lower labials 15–14; scales in ring about eye, 16.

TESTUDINATA

Clemmys caspica caspica Gmelin.

Testudo caspica Gmelin, Reise durch Russland, 3, p. 59, pls. 10, 11, 1774—Hircania.

Clemmys caspica Wagler, Icon. Amphib., pl. 24, 1830.

IRAN: Persepolis, 8 (21035 42, Ernst Herzfeld).

IRAQ: Ba'adri (northeast of Mosul), 5 (19708–10, 19712–14); Halfaya, 4 (19705 7, 19785).

No significant difference is discernible between specimens from Persepolis and those from Iraq.

Testudo graeca Linnaeus.

Testudo graeca Linnaeus, Syst. Nat., p. 198, 1758--Santa Cruz, western Barbary.

HATAY: Amuq Plain, 5 (25356 60, C. W. McEwan).

SYRIA: Homs (between Homs and T-4), 1 (19715).

Testudo graeca is said by Flower (1933, p. 745) to fall into at least four well-marked subspecies. These do not seem to have been defined, and as it is to be hoped that Major Flower may publish something on this topic, our specimens may stand for the present simply as *graeca*.

Testudo zarudnyi Nikolsky.

Testudo zarudnyi Nikolsky, Ann. Mus. Zool. Acad. Sci. Petrograd, 2, p. 307, pl. 17, 1897.

IRAN: Yezd-i-Khast, 3 (21027 9).

These specimens extend the range of *Testudo zarudnyi* westward. They exhibit the flaring corners of the carapace which appear to distinguish this species from *graeca*, in spite of Boulenger's remarks about *zarudnyi* on the occasion of describing *Testudo buxtoni* (1920, p. 251).

Trionyx euphraticus Daudin.

Testudo euphratica Daudin, Hist. Nat. Rept., 2, p. 305, 1802.

Trionyx euphraticus Geoffroy, Ann. Mus. Hist. Nat. Paris, 14, p. 17, 1809.

IRAQ: Baghdad, 1 (19492).

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ZOOLOGICAL SERIES
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MALACOLOGICAL NOTES

BY FRITZ HAAS
CURATOR OF LOWER INVERTEBRATES

FIRST ILLINOIS RECORD OF A JAPANESE POND SNAIL

On November 18, 1938, I found a dead, not full-grown but identifiable specimen of *Cipangopaludina malleata* Reeve, in the outer lagoon in Jackson Park, Chicago. It is entered in Field Museum Catalogue as No. 11438 and is figured herewith (fig. 7).

FIG. 7. *Cipangopaludina malleata* Reeve, from Chicago, Field Mus. No. 11438 ×5/3.

I am indebted to Mr. E. Strandine, of Northwestern University, and to Mr. F. C. Baker, of the University of Illinois, for the statement that to their knowledge this species has never been recorded from Illinois; nor does it seem to have been found in the adjacent states. This Japanese intruder has hitherto been known only from the Pacific slope, and from some places on the Atlantic coast; records of the species in the United States will be found in various volumes of *The Nautilus*.

REVERSED SPECIMENS OF CAMPELOMA FROM THE CHICAGO AREA

Some information concerning reversed specimens of shells belonging to the genus *Campeloma* Rafinesque has been assembled by F. C. Baker in his *Fresh Water Mollusca of Wisconsin* (Bull. Wis. Geol. Nat. Hist. Surv., **70**, 1928). Additional data recorded here refer to the species *integrum* Say and *decisum* Say.

Baker (l.c., p. 67) says with reference to *Campeloma integrum* that he found only one reversed specimen among 160 normal ones, and that none were seen as embryos. Field Museum has one reversed female

of *integrum* (No. 11506), collected on the Wooded Island in Jackson Park, Chicago, by H. W. Clark, in March, 1903, which contained 21 embryos, one of which is reversed. This seems to be the first indication that reversed specimens may transmit their anomaly to their offspring, but the one instance is, of course, inadequate for definite conclusions on this point.

Baker (l.c., p. 60) remarks that reversed specimens of *Campeloma decisum* are very rare, "but one immature shell occurring among over a hundred adult specimens and but four among 260 embryonic young." In the Field Museum collection is a reversed immature shell (No. 11479), found in the outer lagoon in Jackson Park, Chicago, by the writer, on December 6, 1938. A normal female shell (No. 11508), collected in the Kankakee River near Shelby, Lake County, Indiana, by O. P. Hay, on September 20, 1895, includes one reversed embryo among the four contained in it; and there is another reversed embryonic shell contained in a collection of normal *decisum* from the same locality (No. 5256).

TAXONOMY OF THE LARGER GROUPS OF ASIATIC VIVIPARIDS

In arranging the Viviparidae of Field Museum I find it necessary to revise the status of some generic and subgeneric names bestowed on Asiatic viviparid snails. The most modern synoptic view of the family, that of Thiele (Handb. syst. Weichtierk., pp. 114-116, 1929), is out of date on account of Rohrbach's anatomical investigations (Arch. Molluskenk., **69**, 1937), which prove that the Asiatic viviparids (with the exception only of those from Asia Minor belonging to *Viviparus* proper) do not even group with the Viviparinae; they are closely related to the African genus *Bellamya* and constitute with it the subfamily Bellamyinae. Rohrbach (l.c.) clearly showed that the many Asiatic species which had been attributed to true *Viviparus* present anatomical features which can only be compared to those of the African genus *Bellamya*, but he did not discuss the question of their generic position. My work necessitated going into this question, and I arrive at the arrangement of the genera and subgenera of the Asiatic Bellamyinae shown below. It seems that two different groups of genera may be distinguished as follows:

A. A group of thin-shelled, generally larger forms, almost destitute of shell-adornments like knots, ribs, and keels. It contains the following genera:

Bellamya Jousseaume, 1886 (type, *Paludina bellamya* Jouss.), to which most of the African viviparids belong and which

is represented in Asia by species from India (*dissimilis* Muell., *bengalensis* Lam., etc.), from the Sunda Islands (e.g. *javanica v.d.* Busch), from the Philippine Islands (e.g. *angularis* Muell.), and so on.

Lecythoconcha Annandale, 1921 (type, *Paludina lecythis* Benson), from India.

Idiopomus Pilsbry, 1901 (type, *Vivipara henzadensis* Pilsbry), from Burma.

B. A group of thick-shelled genera with generally rather convex whorls, often provided with raised ornamentations in the shape of knots, keels, and even spines.

Mekongia Crosse and Fischer, 1876 (type, *Paludina jullieni* Deshayes), from French Indo-China, a rather highly specialized genus which is probably derived from forms like *Cipangopaludina*.

Eyriesia P. Fischer, 1885 (type *Paludina eyriesi* Morelet), from Cambodia, also a highly specialized form.

Cipangopaludina Hannibal, 1912 (type, *Paludina malleata* Reeve), from Japan, China, and the Amur province of Siberia.

Angulyagra Rao, 1931 [=*Dactylochlamys* Rao, 1925, not Lauterborn, 1901] (type, *Paludina oxytropis* Benson), from India, Burma, and the Philippines. *Angulyagra* proper comprises by far most of the species belonging to this genus.

Acanthotropis[1] subgen. nov. created for *Vivipara partelloi* Bartsch from Lake Lanao, Mindanao, Philippine Islands, is characterized by the possession of a distinct keel at the circumference of the two last whorls; this keel is ornamented by hollow spines curving back, like those in the African freshwater snail *Tiphobia* E. A. Smith (thiarid) or in the *Phyllonotus* section of *Murex*.

Heterogen Annandale, 1921 (type, *Heterogen turris* Annandale), is known only from Lake Biwa, Japan.

Laguncula Benson, 1842 (type, *Laguncula pulchella* Benson), from Chusan Island, a somewhat problematic genus.

Taia Annandale, 1918 (type, *Vivipara naticoides* Theobald), seems to have a rather wide distribution in Asia, where it is

[1] *ακανδα*, spine; *τροπις*, keel.

split up into the following distinguishable groups or subgenera:

Taia proper is confined to India and Burma.

Temnotaia Annandale, 1919 (type, *Taia incisa* Annandale), comes from Burma.

Sinotaia[1] subgen. nov. (type, *Paludina quadrata* Benson) seems to comprise the Chinese species hitherto attributed to *Viviparus*, which group around *quadratus* Benson and *angulatus* Benson. They are characterized by the narrow, rather thick shell with an expanded columellar thickening, mostly blackish towards its outer margin, and by the indication or strong development of keels on the upper, middle, and lower part of the whorls.

Torotaia[2] subgen. nov. (type, *Vivipara clemensi* Bartsch) comprises two Philippine species, *mainitensis* Bartsch and *clemensi* Bartsch. Its characteristics are the broad, somewhat scalarid spire, the ventricose whorls and the presence of some ribs on the whorls which may assume the strength of keels. The umbilicus is always closed and the lower margin of the aperture is protracted to some degree near the columella.

Margarya Nevill, 1877 (type, *Margarya melanoides* Nevill), from Yunnan.

Rivularia Heude, 1890 (type, *Paludina (Melantho) auriculata* Martens) from China.

A NEW LOCALITY FOR RHINOCORYNE PACIFICA

Rhinocoryne pacifica, most striking of all the living Cerithiidae, originally described by Sowerby (1833) as *Cerithium pacificum*, seems by no means abundant. E. von Martens (Biol. Centr. Amer., Mollusca, p. 574, 1900) has summed up our knowledge of this species, and apparently it has not been mentioned in the literature since. Von Martens established the subgenus *Rhinocoryne* for this species, and this is now regarded as of generic rank.

In these references it is mentioned only from the Pacific coast of both Americas from Arica (southern Peru) in the south to Punta Arenas (southwestern Costa Rica) in the north. Field Museum has a lot of 14 specimens of *Rhinocoryne pacifica* (No. 11521), from

[1] Σιναι, China; *Taia*, generic name.

[2] Torus, a raised ornament; *Taia*, generic name.

Corinto, Nicaragua, about 100 miles north of the most northern locality hitherto known.

The specimens were collected by S. E. Meek, in April, 1906, partly in living state, partly inhabited by hermit crabs.

POLYPYLIS, AN APPARENTLY OVERLOOKED SUBGENUS OF SEGMENTINA

The subgeneric name *Polypylis* was proposed by Pilsbry (Proc. Acad. Nat. Sci. Phila., p. 166, 1906) for some east Asiatic species of planorbids formerly attributed to the European genus *Segmentina* Fleming and grouping around *Planorbis largillierti* Dkr. These species differ from *Segmentina* proper in the following characters, using Pilsbry's own words: "The shell is less compressed and not carinate, but glossy with deeply clasping whorls. The parietal lamina is obliquely transverse, the others transverse, basal long, a shorter one in the outer wall, and one or two in the upper margin. There are several or many barriers." True *Segmentina* on the contrary is characterized by "a very glossy, flattened shell with acutely angular periphery, simple thin lip, deeply embracing whorls, and barriers composed of three laminae (parietal, basal, and upper) transverse to the whorl, leaving a narrow, three-branched space between them."

These differences may be seen in the accompanying figures. Figure 8, *b*, shows the disposition of barriers in the European *Segmentina nitida* Mueller; figure 8, *a*, exhibits that of the Chinese *Segmentina hemisphaerula* Benson; figure 8, *b*, is copied from Rossmaessler (Icon., 1, fig. 114); figure 8, *a*, is new. In both cases the last part of the last whorl has been removed in order to show clearly the set of laminae. These figures show that the east Asiatic segmentinas cannot be united to *Segmentina* proper, and that Pilsbry was right in proposing for them the new subgenus *Polypylis*.

FIG. 8. a, *Segmentina* (*Polypylis*) *hemisphaerula* Benson, Field Mus. No. 7388, showing disposition of inner laminae. ×3. b, *Segmentina* (*Segmentina*) *nitida* Mueller, showing inner laminae (from Rossmaessler). ×3.

Though plainly described, this name escaped the attention of the recorders. Neither the *Zoological Record*, the *Nomenclator generum et subgenerum animalium*, nor Thiele, in his comprehensive *Handbuch der systematischen Weichtierkunde*, mentions it; even Mori, the most recent author on east Asiatic planorbids (Mem. Coll. Sci. Kyoto Imp. Univ., B, 14, 1938) omits it. Germain, who worked on Planorbidae in 1921–24 (Rec. Indian Mus., 21), had noticed it, but, as

he says (p. 164), he did not judge the differences emphasized by Pilsbry sufficiently important to warrant the new subgenus; he therefore groups all the east Asiatic species which may belong here with true *Segmentina*.

From Germain's list of species we can clearly see which forms have the characteristic disposition of the inner laminae, and thus belong to the subgenus *Polypylis*. These are:

Planorbis hemisphaerula Benson, 1842. *Planorbis largillierti* Dunker, 1867, is synonymous with this species; thus the genotype of *Polypylis*, for which Pilsbry had designated *Planorbis largillierti* Dunker, automatically becomes *Planorbis hemisphaerula* Benson.

Planorbis calathus Benson, 1850. Germain cites this species as *Segmentina calatha*, but the specific name ought to be *calathus*, this word being a noun meaning a basket.

Segmentina lucida Gould, 1859 (=*Segmentina usta* Gould, 1859).

Planorbis swinhoei H. Adams, 1870.

These species must now be cited as *Segmentina* (*Polypylis*) *hemisphaerula* Benson, *Segmentina* (*Polypylis*) *calathus* Benson, and *Segmentina* (*Polypylis*) *swinhoei* H. Adams. The first lives in southern China, including the Riu-kiu Islands; the second is found in British India and Ceylon, in Siam, in Java, and in the Aroe Islands, and the third in the Riu-kiu Islands and in Japan; the last is known only from the Island of Formosa and is occasionally considered a mere subspecies of *lucida* Gould.

The rest of the species included by Germain in the Asiatic segmentinas seem to differ from *Polypylis* in the absence of inner laminae.

WHAT IS LIMNAEUS SORDIDUS KUESTER, 1862?

Kuester described a *Limnaeus sordidus* supposedly from Central America in his monograph of the genus *Limnaea* (in Martini-Chemnitz, Illustr. Conch. Cab., (2), 1, Abt. 17b, p. 58, figs. 15 16, pl. 12, 1862). This species was not reported from Central America by later collectors, and came to be considered a spurious one, except by von Martens. Von Martens believed that it might be an American species after all (Biol. Centr. Amer., Mollusca, p. 379, 1899), as it very much resembled some of Haldeman's *Limnaea palustris* in shape and in its latticed sculpture; he furthermore noticed in the Dunker collection, now in the Berlin museum, a shell supposedly originating in Central America, which resembled *sordidus* in every respect. On the other hand, he had never seen a *palustris* form from Central America, and

hence decided that Kuester's *sordidus* might be a North American shell comparable to *L. elodes* Say. F. C. Baker, in his monograph of the American limnaeids (Spec. Publ. Chicago Acad. Sci., No. 3, p. 313, 1911), went so far as to combine *sordidus* and *palustris*, mistrusting the locality "Central America," on the ground that the *palustris* group had never been found south of the Rio Grande.

In the collections in Field Museum I find four specimens of a limnaeid (No. 11466) from Lake Chalco, central Mexico, collected by S. E. Meek, in April, 1901, which, though in a poor state of preservation, undoubtedly belong to the *palustris* group. They combine the *palustris* shape of the shell with the sculpture of vertical and horizontal ridges, forming the fenestration described by Kuester as characteristic of *Limnaeus sordidus*, and visible in our copy of Kuester's original figure (fig. 9). The specimens in Field Museum differ from those figured by Kuester in being somewhat more slender, but not so much so as to prevent their identification with *sordidus*.

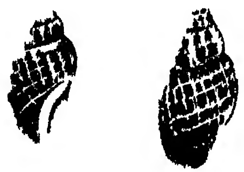

FIG 9 *Stagnicola* (*Stagnicola*) *palustris sordida* Kuester (from Kuester's original pictures of *Limnaeus sordidus* Kuester). ×1.

As there is no further doubt that a form of *palustris*, apparently distinguishable from the typical one and from the North American subspecies of *palustris*, exists in Mexico, and as Kuester's *sordidus* is based on a fenestrated Mexican form of *palustris*, I do not hesitate to name the Chalco specimens *Stagnicola* (*Stagnicola*) *palustris sordida* Kstr.

THE SOUTH AMERICAN SPECIES OF PLANORBULA

Apparently no author has hitherto assigned any South American planorbid to *Planorbula*, though earlier workers did know that some species in question are provided with internal shell septa; these include Clessin (Martini-Chemnitz, Illustr. Conch. Cab., (2), **1**, Abt. 17, *Planorbis*), when describing his *Planorbis janeirensis* (l.c., p. 122, fig. 3, pl. 18, 1885), and Fred Baker, when publishing his *Segmentina paparyensis* (Proc. Acad. Nat. Sci. Phila., 1913, p. 662, figs. 9–11, pl. 26, 1914). Lutz, the last reviser of the Brazilian planorbids (Mem. Inst. Oswaldo Cruz, **10**, pp. 45 61, pls. 15 18, 1918) dealt only with their specific discrimination and did not touch the problem of their generic position; he, therefore, left *paparyensis* with *Segmentina*.

When I found some specimens of *"Segmentina" paparyensis* F. Baker in a lot of shells from northeastern Brazil, which had been entrusted to me for classification by Dr. O. Schubart, then in Recife, and on which I shall report elsewhere, I was immediately struck by the idea that this species, together with *Planorbis janeirensis* Clessin, of which it is only a local subspecies, belongs to *Planorbula.* It is obvious also that they differ so much from this genus that they have to be placed in a distinct new subgenus, for which I propose the name **Obstructio** (for reasons which will be obvious), designating *Planorbis janeirensis* Clessin as the type. The characteristic features of this new subgenus, in comparison with true *Planorbula,* are as follows:

Thickening of the lip constantly wanting; disposition of the six internal septa as follows: two parietal septa subequal, at least never so different in size as in true *Planorbula;* four palatal septa, the two upper nearly horizontal.

There is in Africa a planorbid group of snails which, from the anatomical data available (Connolly, Trans. Roy. Soc. S. Afr., **12**, pp. 196–199, fig. 25, 1925), and from conchological characters, must belong to *Planorbula.* This group is represented by *Planorbula pfeifferi* Krauss and its allies. Jickeli established the subgenus *Planorbulina* for it (Nova Acta Acad. Leop. Carol., **37**, p. 221, 1874).

NOTES ON VALVATIDS WITH A DESCRIPTION OF A NEW SUBGENUS

In a recent paper (Uber potientielle Skulpturbildung bei *Valvata (Cincinna) piscinalis antiqua* Sow., Arch. Moll. Kde., **70**, pp. 41–45, 1938) I have described what I called a "potential shell-sculpture" in the European *Valvata (Cincinna) piscinalis antiqua* Sow. The specimens considered were collected in Lake Lucerne, Switzerland, and are distinguished from ordinary ones from other localities by a faint but unmistakable sculpture of radial rib-like striae and of spirally revolving lines. The fact that only valvatas from lacustrine habitats show such a shell-sculpture leads me to the conclusion that the lacustrine environment is in some way correlated with sculpturing in fresh-water mollusk shells.

In the paper mentioned above I gave a list of what is known about palaearctic sculptured *Valvata,* both recent and fossil. Heavily sculptured forms are always restricted to some lacustrine basin, and smooth, unsculptured valvatas of Europe and Asia, inhabiting various fresh-water habitats, develop traces of sculpture only when they occasionally live in a lake; they thus prove that the formation of shell-sculpture is an inborn characteristic of valvatids, which remains

inactive in the non-lacustrine environment, but becomes potential when the habitat, for reasons still unknown, but certainly in some relation to lacustrine life, encourages its development. Such development is only phaenotypic.

Many species of valvatids restricted to lacustrine basins have acquired rather conspicuously developed shell-sculpture: the subgenus *Megalovalvata* Lindholm from Lake Baikal; *Costovalvata* Polinski, from Lake Ochrida in Albania; and the uncoiled tubiform fossil valvatid genus *Orygoceras* Brusina in the southeastern European Pliocene—the so-called "Neogene Lake." In all these cases the presence of sculpture has surely become a genotypic, inheritable feature. The presence of a keeled sculpture in the North-American subgenus *Tropidina* H. and A. Adams, is probably due to such a genotypic feature acquired during prolonged lacustrine life and become invariable, so that even after the species thus adorned emigrated from their original habitat to enter other fresh-water habitats, the sculpture remained fixed.

All the palearctic lacustrine and sculptured valvatids have received subgeneric names in correspondence with the type of their sculpture and their geographic isolation. Spiral sculpture seems to be more frequent than radial, only one subgenus being hitherto known which exhibits the latter type, *Costovalvata* from Lake Ochrida; but in this subgenus the radial sculpture is not clearly shown, as it is crossed by the traces of a spiral sculpture around the circumference of the whorls. There are a few valvatids, however, which present definitely radial sculpture, which may be restricted to the apical whorls or which may extend over the whole shell, but which can always be discerned. These features distinguish the species in question from all other living or extinct valvatas, and I therefore feel justified in uniting them into a new subgenus which also has some characteristic and differentiating anatomical characters and which also apparently differs from the rest by some ecological habits. I call this new group:

Pleurovalvata[1] subgen. nov.

Type, *Valvata sincera* Say.

Shell.—Trochiform, globose or depressed, exhibiting always on the apical whorls and usually on the whole shell surface a regular, radial striation which is often raised into thin, elevated, rib-like lamellae.

[1] πλευρον, rib; *Valvata*, generic name.

Jaw.—Serrations on the lower margins of plates much finer and more numerous than in other subgenera.

Radula.—Central tooth either higher or larger than in other valvatas.

Remarks.—*Valvata lewisi* Currier also belongs in this subgenus. The fossil Californian *Valvata densestriata* Pilsbry may be found to belong here likewise.

Judging from F. C. Baker's notes (The Fresh Water Mollusca of Wisconsin, Pt. I, Gastropoda, Bull. Wis. Geol. Nat. Hist. Survey, **70**, 1928), from which I also have derived the data referring to jaw and radula, all the species and their varieties which are regarded above as certainly belonging to *Pleurovalvata,* are found in lakes. Only the var. *helicoidea* Dall of *lewisi* is reported from a slough, and it is worth mentioning that in this non-lacustrine form the sculpture is often obsolete. Thus the ecological distribution of the members of this new subgenus *Pleurovalvata* helps to support my theory that lacustrine environmental conditions are in some way connected with the development of shell-sculpture.

AFFINITY OF PAPUINA GLOBULA

Papuina globula **I. Rensch, Zool. Anz., 92, p. 226, fig. 1, 1930; von Benthem-Jutting, Nova Guinea, 17, Zool., p. 43, 1933.**

The original locality for this species is given as "Pulie-Fluss, Kap Merkus, Neu-Pommern." Field Museum has a series of 11 specimens (Cat. No. 11707) from Pelilo Island, near Cape Merkus, southwestern New Britain (= Neu Pommern) collected by A. B. Lewis during the Joseph N. Field Anthropological Expedition, 1909 13. These specimens leave no doubt that *globula* is very closely allied to *Papuina fringilla* Pfr. from New Georgia, Solomon Islands, and from the Admiralty Islands, and that it is probably only an albino geographical race of it. I. Rensch (l.c.) suggests that *Crystallus fictilia* Clapp (Bull. Mus. Comp. Zool., **65**, p. 397, pl. 4, figs. 1 3, 1923) from Anki, Malaita Island, Solomon Islands, may be identical with *P. globula,* but this view cannot be supported, Clapp's species apparently being a member of the subgenus *Crystallopsis,* whereas *globula* proves to be a true *Papuina.* It is listed in Field Museum's collection as *Pàpuina fringilla globula* I. Rensch.

IDENTITY OF PLACOSTYLUS (LEUCOCHARIS) DORSEYI

The species mentioned was described in 1910 (Field Mus., Zool. Ser., **7**, p. 219, pl. 4, fig. 1). Dall had only one specimen before him, the type (Field Mus. No. 11254), which came from Anair Island,

near New Ireland, Solomon Islands; the author considered his new species to be "by far the smallest and most delicate species of *Placostylus*."

When reviewing Field Museum's collection of Melanesian land shells, I was surprised to find that Dall had attributed the small, delicate species he had described, to *Placostylus*, for it obviously is a *Partula* and, furthermore, a form closely related to *P. flexuosa* Hartman. I do not hesitate, therefore, to remove it from *Placostylus* and to write it *Partula* (*Melanesica*) *flexuosa dorseyi* Dall, since it may be subspecifically different from typical *flexuosa*, coming from another island.

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CARCINOLOGICAL NOTES

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While setting in order the small miscellaneous accumulation of crustaceans in Field Museum's reference collection, I found a stomatopod which requires comparison with the available descriptions, and a new brachyuran, both from the Fiji Islands. My work on the collection has been under the direction of Dr. Fritz Haas, Curator of Lower Invertebrates, and I am indebted to him for aid and advice in drawing up the present brief paper.

Gonodactylus glyptocercus Wood-Mason.

Gonodactylus glyptocercus Wood-Mason, Proc. Asiatic Soc. Bengal, p. 232, 1875.

Protosquilla cerebralis Brooks, Voy. H. M. S. *Challenger*, **16**, Stomatopoda, p. 72, pl. 14, figs. 2, 3; pl. 16, figs. 2, 3, 1886.

Gonodactylus glyptocercus Kemp, Mem. Indian Mus., **4**, p. 186, 1913; Bigelow, Bull. Mus. Comp. Zool., **72**, p. 136, 1931.

Body form.—Not uniform in width from the anterior edge of the carapace to the posterior edge of the telson, but the exposed segments of the thorax quite slender in comparison with the carapace and abdomen. The entire animal is less compact than is pictured by Brooks and looks much more slender and graceful.

Carapace. Greatest breadth approximately equals the median length; laminar-looking structure underneath the carapace in the reproduction of Brooks' drawing is, in reality, the raptorial limb (see appendages). The eyes are one-third the length of the carapace, with the median spine of the rostrum reaching about one-fourth the length of the eyestalk.

Abdomen.— In the fifth abdominal somite on each side of the two median parallel longitudinal grooves, 12 grooves radiate obliquely, posteriorly and dorsally for those eight which are dorsally situated, and posteriorly and ventrally for those four which are laterally situated. Each groove of the entire 26 is distinct in itself with no bifurcation.

In the sixth abdominal somite the ω-shaped ridge on either side near the anterior margin is quite obscured by a more complicated pattern, but the two submedian U-shaped ridges are readily visible.

The telson dentition of 9, 1, 0 corresponds to that given by Brooks, as does the entire design of the telson.

Appendages.—The uropod as well as the antennae is much larger in comparison with the total animal than is shown by Brooks. The outer spine of the process from its base is twice the length of the inner. As mentioned by Brooks, there are on the proximal segment of the exopodite ten conspicuous marginal spines, which also curve upwards towards the dorsal surface (see Brooks' description and figure).

The position of the raptorial limb in reference to the body is entirely different from that shown by Brooks. It is here compared in the drawings.

Color.—This particular specimen possesses the characteristic patches on the sixth and seventh thoracic and first and fourth abdominal somites, three distinct dark bands on the raptorial limb, a patch in each corner of the carapace and on the antero-median border, and scattered pigmentation on the remaining thoracic segment and the second, third, and fifth abdominal segments, but not on the sixth segment or telson.

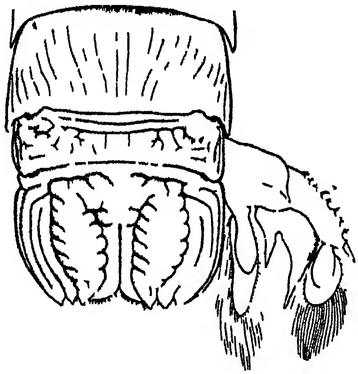

FIG. 10. Last two abdominal segments, telson, and right uropod of *G. glyptocercus.* ×4.

Measurement.—The length is 32 mm. or approximately the same as the specimen described by Brooks. This specimen was also from the Fiji Islands.

Remarks.—The characteristics and range of variation of this species of *Gonodactylus* being under discussion, it seemed advisable

to supply additional information from the specimen (here figured) in Field Museum's collection, taken at Viti Levu, Fiji Islands, by the Crane Pacific Expedition of 1929 (No. 1904).

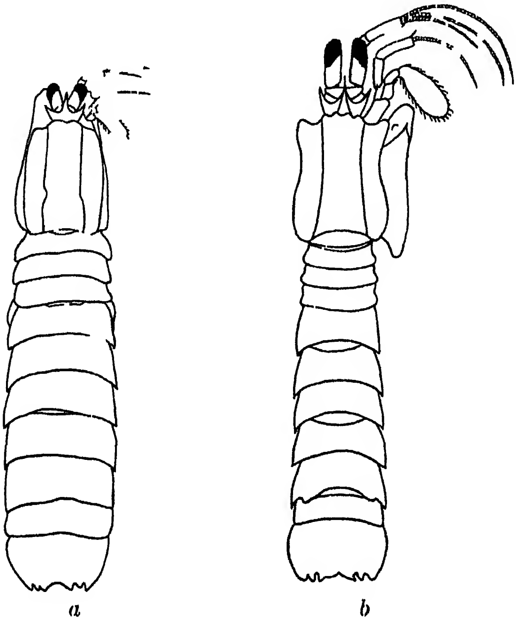

FIG. 11. *G. glyptocercus*. *a.* After Brooks. ×2. *b.* Field Mus. 1904. ×2.

Uca ischnodactylus sp. nov.

Material.– Twelve specimens (1 female and 11 males) from Suva Harbor, Fiji Islands, in mangrove; Crane Pacific Expedition, March 16, 1929. Type (male, Field Museum 1971). Paratypes (Field Museum 1972).

Diagnosis. Allied to *U. arcuata* De Haan and *U. inversa* Hoffmann; front spatuliform and very narrow; movable finger quite slender, with a curved, toothed blade at extremity.

Carapace.– Convex in both directions; H-marking visible but not strongly defined; strongly convergent posteriorly; entirely smooth except for a few minute granules at the anterolateral angles; front spatuliform, about one-twentieth the width of carapace; fronto-orbital width great, meeting lateral margins to form an acute, prolonged antero-lateral angle; orbital margins sinuous, raised borders finely serrate.

Ambulatory legs.—Minutely granular, especially the meral joints; hair sparse and short, found principally on the meral joints.

Chela.—Outer surface of palm and carpal joint roughly tuberculate, the internal lateral margins of the carpus and palm being fringed with a row of hairs; the oblique tuberculate ridge of the inner surface of the palm terminates at carpal cavity; fingers slender and gaping except at tips, which overlap; inner edge of fixed finger finely dentate throughout entire length, the size of the tubercles decreasing somewhat distally; principal teeth of dactylus in two main groups of two proximal and one distal; extreme distal portion of dactylus ends in a definite, toothed, blade-like projection, the proximal and distal teeth of which are the largest; this projection

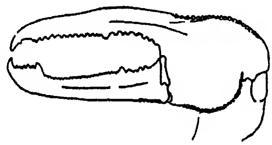

FIG. 12. *U. ischnodactylus*, hand of large cheliped. ×2.

is prolonged into a curved spine which overlaps the tip of the fixed finger.

Color.—Carapace (in alcohol) dull green-brown; upper internal surface of palm red-orange, the color extending a short distance up into the fingers; orange patch also on the under surfaces of all the joints of the cheliped except the carpus; remainder of cheliped and the ambulatory legs a yellow-white.

Measurements of type and allotype.—Length of carapace of type 12.5, of allotype 11.8; width of carapace of type 21, of allotype 17.

Variation.—No great divergence from the type except for the principal teeth groups which can be, besides the 2:1 ratio, 3:1, 3:0, or even 0:0; seven males found to be left-handed, four right-handed.

Remarks.—There appears to be no close resemblance to any single species, but the general body form is similar to that of *U. arcuata* De Haan and *U. heterochelos* Lamarck, although tapering more posteriorly. The shape of the chela is, as a whole, that of *U. inversa* Hoffmann, while the dentition of the hand follows that of *U. arcuata* with the exception that the dactylus only, and not the fixed finger, has the curved blade.

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THREE NEW BIRDS OF THE GENUS STACHYRIS[1]

BY H. G. DEIGNAN[2]

The allocation of specimens of the rufous-crowned forms of *Stachyris* from Burma, Siam, and French Indo-China shows that considerable confusion has existed in the minds of authors as to exactly which birds should be given the available names, and, in fact, verbal descriptions of one form often serve equally well for almost any other member of the group.

In 1916 Gyldenstolpe recorded two Siamese birds (apparently representing two subspecies, if not two distinct species) which he called *Stachyridopsis rufifrons*, with the observation that one probably belonged to *bhamoensis* and the other to typical *rufifrons*. In 1920 the same author listed these specimens as *Stachyridopsis rufifrons rufifrons*. In 1933 De Schauensee, following Gyldenstolpe, recorded a single specimen from Doi Chiengdao as *Stachyris rufifrons rufifrons*.

In French Indo-China similar difficulties have prevailed. Birds from Haut-Laos and Tonkin were recorded in 1931 by Bangs and Van Tyne as *Stachyris rufifrons rufifrons*, but another series from Bolovens in Bas-Laos was listed in 1932 by Delacour and Engelbach as the Assamese *Stachyris rufifrons ambigua*.

In 1937 two breeding males were taken by me on Doi Chiengdao, and, points of disagreement being found between them and Hume's description of *rufifrons*, De Schauensee's specimen from the same locality was borrowed, together with an odd bird of anomalous characters from Doi Pha Hom Pok. From the American Museum of Natural History I was able to obtain topotypical material of both *rufifrons* and *ambigua*, which made it evident that the Siamese specimens had been misidentified. This raised the question of the exact identity of birds from French Indo-China, and, in accordance with my request, series of skins from Bolovens and from Haut-Laos were forwarded to me from Field Museum.

[1] Published by permission of the Secretary of the Smithsonian Institution.

[2] Division of Birds, United States National Museum.

The gathering together of this material shows that all identifications of specimens from southeastern Asia have been in error, and that at least three unnamed forms occur in Siam and French Indo-China. The three birds from Doi Chiengdao cannot be considered representatives of any known species. From *ruficeps* they differ in the absence of yellows from the plumage; from *rufifrons* in having gray lores and throat; from *poliogaster* in the absence of gray from the belly; from *pyrrhops* in having no black on the throat. Moreover, a form of *rufifrons* occurs within 50, if not 25, miles of Doi Chiengdao, and there is even some reason to believe that both *rufifrons* and *ruficeps* occur on Chiengdao itself.

To the Philadelphia Academy of Natural Sciences and the American Museum of Natural History I am indebted for the loan of comparative material; to Field Museum both for the use of its specimens and for the privilege of naming the two new forms represented among them.

Stachyris rodolphei[1] sp. nov.

Type from Doi Chiengdao, Chiengmai Province, northwestern Siam. Alt. 3,525 feet. No. 336891 United States National Museum. Adult male. Collected March 21, 1937, by H. G. Deignan.

Description.—Front and crown dull, dark rufous, with inconspicuous dark shaft-streaks; upper parts, including wings and tail, dark olivaceous-brown; lores and feathers above eye pure gray; ear coverts olive-brown; edge of wing, under wing coverts, and axillaries pale gray; chin and upper throat pale gray with conspicuous black shaft-streaks and sharply defined from the remaining under parts; lower throat and upper breast olivaceous-buff, changing to a dull, light olivaceous-brown on rest of breast, abdomen, flanks, and under tail coverts—the whole bird below darker and duller than any race of *rufifrons*. Irides red; bill dark gray; feet, toes, and claws olive (fide De Schauensee).

Range.—The three known specimens were taken at 3,525 feet, 3,825 feet, and 5,500 feet. The two birds from lower elevations were found in tall bamboo forest, acting like *Mixornis;* each had the testes greatly enlarged.

Stachyris rufifrons adjuncta subsp. nov.

Type from Phong Saly, Haut-Laos, French Indo-China. Alt. 4,400 feet. No. 78911 Field Museum of Natural History. Adult male. Collected April 26, 1929, by J. van Tyne.

[1] In honor of Baron Rodolphe Meyer de Schauensee, of whose generosity I have availed myself on numerous occasions.

Description.—Front and crown dark rufous, with conspicuous black shaft-streaks; upper plumage dark olivaceous-brown; lores brownish-gray or pale grayish-brown; ear coverts pale buff; edge of wing, under wing coverts, and axillaries pure white; chin and upper throat white with conspicuous black shaft-streaks and contrasting strongly with remainder of lower plumage, which is darker than warm-buff (Ridgway) and slightly more olivaceous on the flanks; the bill in the dried skin horny-black, probably plumbeous in life.

Range.—Haut-Laos and Tonkin, French Indo-China.

Stachyris rufifrons insuspecta subsp. nov.

Type from Thateng on the Plateau of Bolovens, Bas-Laos, French Indo-China. No. 90967 Field Museum of Natural History. Adult male. Collected December 3, 1931, by J. Delacour.

Description.- Front and crown orange-rufous with conspicuous black shaft-streaks; upper plumage medium olivaceous-brown; lores yellowish-gray; ear-coverts olivaceous-fulvous; edge of wing, wing coverts, and axillaries white washed with buffy; chin and upper throat buffy-white (or buff) with conspicuous black shaft-streaks and merging into remainder of lower plumage, which is nearest antimony yellow (Ridgway) and slightly more olivaceous on the flanks; bill horny-black in the dried skin, in life "gray."

Range.—Bas-Laos, French Indo-China; northwestern Siam.

Remarks.—It is well known that yellow is a very fugitive color in the *Timeliidae,* and this fact is exemplified by my series of *Stachyris ruficeps davidi,* in which the color of the under parts varies from yellowish-gray to bright yellow. On the whole, the older the skin, the paler the color, but this is not consistently the case; there is no doubt a certain amount of change while the bird is alive, and as a result fresher specimens are sometimes more faded than much older ones.

In typical *ruficeps,* which never has the pure, bright yellow hue of *davidi,* much less alteration occurs. I have before me four specimens from the same locality, of which one was collected in 1876, two in 1880, and one in 1931. The old skins differ from the comparatively fresh one in a slightly duller color below, especially on the throat, and a foxing of the upper parts from olive-green to olive-brown.

That the forms of *rufifrons,* which lack yellow coloration, show much change with age, is less certain. My specimens of typical *rufifrons* were taken in 1911, 1912, and 1915, and are the very

specimens described by Harington (Journ. Bombay Nat. Hist. Soc., **23**, p. 628, 1915). Likewise, my specimens of *ambigua*, which were collected in 1895, are paratypes of Harington's race, and were equally carefully described at the same time and place. These birds, in 1938, agree exceedingly well with the descriptions made in 1915; what changes I have made in color nomenclature have been merely for the sake of greater accuracy in dealing with an increased number of nearly related forms. I might add that my whole series of *adjuncta* was taken in 1929; of my series of *insuspecta*, six were collected in 1931, one (northern Siam) in 1938.

I am not at all satisfied with the conventional arrangement of the various forms. *Stachyris ruficeps ruficeps* differs from *davidi* in a degree which, in this group, may well have specific significance. Moreover, no one has recorded specimens intermediate between the Himalayan and Chinese forms. If *ruficeps* and *davidi* are eventually shown to belong to different species, my *insuspecta* will no doubt properly be considered a southeastern race of *ruficeps*. With the present arrangement this is not possible, because of the occurrence of *davidi* at no great distance in Annam. Until more is known of the respective ranges of these birds, I shall leave *insuspecta* in the *rufifrons* complex, as a matter of convenience.

It is believed that the appended tabular arrangement of the characters of *rufifrons* and its races (as herein constituted) will prove more useful than pages of formal descriptions in separating these birds. The scheme employed is that of Harington (1915) somewhat expanded.

A list of material examined is appended:

Stachyris pyrrhops.—2 (Kashmir, 1; Rampur-Bushar, 1).

Stachyris ruficeps ruficeps.—4 (Sikkim, 4).

Stachyris ruficeps davidi.—53 (Szechwan, 31; Yunnan, 5; Fukien, 6; Tonkin, 7; south Annam, 1; Bhamo District, 3).

Stachyris ruficeps praecognita.—3 (Taiwan, 3).

Stachyris rodolphei.—3 (northern Siam, 3).

Stachyris rufifrons rufifrons.—3 (Pegu Yomas, 3).

Stachyris rufifrons ambigua.—3 (northern Cachar, 3).

Stachyris rufifrons adjuncta.—5 (Haut-Laos, 3; Tonkin, 2).

Stachyris rufifrons insuspecta.—7 (Bas-Laos, 6; northwest Siam, 1).

STACHYRIS RUFIFRONS

	S. r. ambigua Harington	*S. r. pallescens* Ticehurst	*S. r. rufifrons* Hume	*S. r. adjuncta* subsp. nov.	*S. r. insuspecta* subsp. nov.
Type locality	Northern Cachar	Arakan	Pegu	Haut-Laos	Bas-Laos
Bill	In life: "light fleshy, culmen and tip darker" (collector); in dried skin: maxilla horny-brown, mandible fleshy-yellow		In fresh skin: "blue" (Hume); in dried skin: horny-black	In dried skin: horny-black	In life: "gray" (collector); in dried skin: horny-black
Lores	Buffy		Whitish	Brownish-gray or pale grayish-brown	Yellowish-gray
Ear coverts	Pale buff		Pale buff	Pale buff	Olivaceous-fulvous
Crown	Orange-rufous covering entire crown; black shaft-streaks conspicuous		Rufous, fading out at middle of crown; black shaft-streaks inconspicuous or wanting	Dark rufous covering entire crown; black shaft-streaks conspicuous	Orange-rufous covering entire crown; black shaft-streaks conspicuous
Upper plumage	Medium olivaceous-brown	"Less brown, more olive-gray" than *rufifrons* (Ticehurst)	Light olivaceous-brown	Dark olivaceous-brown	Medium olivaceous-brown

(*Continued on p. 114*)

STACHYRIS RUFIFRONS—*Continued*

	S. r. ambigua Harington	*S. r. pallescens* Ticehurst	*S. r. rufifrons* Hume	*S. r. adjuncta* subsp. nov.	*S. r. insuspecta* subsp. nov.
Edge of wing, under wing coverts, axillaries	Pure white		Pure white	Pure white	White washed with buffy
Chin and upper throat	White, faintly washed buffy, with black shaft-streaks, the white merging into remainder of lower plumage		White with conspicuous black shaft-streaks, the white contrasting with remainder of lower plumage	White with conspicuous black shaft-streaks, the white contrasting strongly with remainder of lower plumage	Buffy-white (or buff) with conspicuous black shaft-streaks, the buffy-white merging into remainder of lower plumage
Lower plumage	Darker than warm-buff (Ridgway), washed olivaceous on flanks	"Creamy" (Ticehurst)	Warm-buff (Ridgway), with no olivaceous wash on flanks	Darker than warm-buff (Ridgway), slightly more olivaceous on flanks	Nearest antimony yellow (Ridgway), slightly more olivaceous on flanks
Distribution	Sikkim; Assam; Manipur	Arakan	Pegu	Haut-Laos; Tonkin; (?)Yunnan	Bas-Laos; (?)east Siam; northwestern Siam; (?)southeastern Shan States

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A TENTATIVE CLASSIFICATION OF THE PALEARCTIC UNIONIDS

BY FRITZ HAAS
CURATOR OF LOWER INVERTEBRATES

INTRODUCTION

The arrangement which is to follow is based upon more than thirty years' experience in work on unionids in general and on the palearctic ones in particular; it aims to place the pearly fresh-water mussels of the palearctic region within the general system of the unionids, and to show the natural inter-relationships of the forms. This requires some mention of earlier taxonomic essays on the subject.

Until the middle of the last century, that is to say, until the time of Rossmaessler in Germany and Dupuy in France, Linnaean methods prevailed; every animal believed to be unknown to science was described as a new species and nobody worried about the natural relations of the "species" thus originated. This being so, it is not surprising to find that many phaenotypic features were mistaken for specific ones and that many forms which had nothing to do with each other were thrown together. It seems that Rossmaessler was the first to recognize clearly the transformation of the unionid shell by environmental conditions; he, at least, knew about the shaping influence of lacustrine life, which manifests itself in the larvation of the still specifically characteristic juvenile shell, or in that of the fluviatile phase of unionids.

The following era may be characterized by the methods of J. R. Bourguignat and his pupils—Locard, Servain, Coutagne, and many others. This *nouvelle école* attributed specific value to all the differences of shape in fresh-water mussels, which may have originated through environmental influences as well as through geographic isolation. Under this school, discrimination went far more into detail than under the Linnaean method: each shell which differed from an already known mussel in three dimensions, or by the indices calculated from them, was a new species. It is obvious that such a

method, because of the impossibility of securing exact measurements in the always somewhat ventricose unionid shell, could afford approximate figures only; it led inevitably to the description of every individual examined as a new species. Umbonal sculpture and details of the hinge composition were not considered at all. Thus, convergencies due merely to similarity of measurements in the three dimensions, often led to unwarranted inferences with regard to natural relations. The placing of *Margaritifera margaritifera* and of *Psilunio littoralis* close to certain elongated forms of crassoid unios affords an example.

Truth compels us to admit that, leaving aside slips of judgment due to deficiencies of the method, the natural arrangement of the many described "species" was not spoiled; on the contrary, they generally were united into groups, which correspond to a certain degree to our modern racial groups. The geographical factor, however, without which a natural taxonomic arrangement can not now be imagined, does not play any rôle in the Bourguignatian method, nor was the anatomy of the soft parts considered.

Another Frenchman, H. Drouët, stands quite alone among his contemporaries, by reason of the emphasis he placed upon the connection between the shape of his new unionids and the life conditions of their respective habitats. Drouët was, indeed, a pioneer, but he knew too little about the ecology of fresh-water mussels and was therefore often deceived by convergent shapes.

After Rossmaessler's death, at a time when descriptions of new unionids were produced by the hundreds in France, in Italy, and in other countries, work on fresh-water mussels lagged in Germany. The German malacologists (especially Kobelt, who continued Rossmaessler's incomplete *Iconographie*) did not agree with Bourguignat's views, which were also in disfavor with some of the French specialists; for example, with the editors and collaborators of the *Journal de Conchyliologie*. Kobelt's disapproving attitude had won him Bourguignat's intense hatred, but he kept to his own ideas on unionids, which he did not publish until after Bourguignat's death.

The list of the Unionidae in C. A. Westerlund's *Fauna der in der paläarctischen Region lebenden Binnenconchylien* (7, 1890) shows how Bourguignat and his school, to which Westerlund belonged, believed the fauna of palearctic fresh-water mussels to be composed.

More modern ideas on this subject originated with Kobelt, who, in various publications, pointed out the isolating effect of hydrographic frontiers. By many examples he tried to prove the theory,

upon which his principal conclusion was based, that a natural arrangement of the unionids had to take into consideration their distribution in the different hydrographic systems. When this view was accepted, and it was understood that the overwhelming number of described palearctic unionids must be reduced to a very limited number of "fundamental" species, there was the unfortunate circumstance that nobody knew which these fundamental species might be.

Everyone agreed, at least, that these fundamental species, whichever they might be, had given origin to local races in the different parts of the river systems inhabited by them. Collectors and scientists—among them, thirty years ago, even the writer of these lines—began to prove the existence of these local races and to describe them wherever necessary. In Germany, where the Bourguignat method had not been so popular as it had been in France, Italy, and the lower Danube Basin, comparatively few unionids had been described, aside from the fundamental ones, so that there were few names available for such new races as seemed to be worth describing. New names were invented, and I plead guilty to having encumbered nomenclature with not less than fifteen new denominations, bestowed mostly on mussels from western Germany.

Looking backward, I can not wholly disapprove of my course at that time. I have come to realize that the differences mistaken by me for racial features were phaenotypic, due to environmental factors; furthermore, I have learned that the limited geographic areas inhabited by such uniformly characterized fresh-water mussels, were nothing but areas of uniform conditions of life. But even if such distinct local forms, for instance, those of the *Unio crassus* group, are not worth retaining as trinomially named races, they are nevertheless somewhat more than mere variations. They can be considered to be incipient races, having a mutative basis. That such slight differences, which are nevertheless distinguishable to an experienced eye, can not be made the basis of named forms, is due to our present system of nomenclature, which does not go beyond a third name. I have been greatly pleased to learn from modern herpetologists and ornithologists that they have found similar conditions and feel some need for a method of designation for the above-mentioned "subraces," which we may call incipient ones. I can not but agree that this would be desirable.[1]

[1] William Morton Wheeler, in his work on ants, consistently employs a quadrinomial nomenclature; cf., for example, his *Ants* (1910).

We shall leave aside, as being far from our present object, the merely geographical part of the unionid problem, which, following Kobelt's ideas, involved the tracing of old and bygone connections between now separated river systems, and other related subjects.

The arrangement of the palearctic unionids which follows rests mostly on Kobelt's ideology. It is backed by long experience in field observation and indoor study and by personal knowledge of many types of unionids contained in the extremely rich collection of the Senckenberg Museum in Frankfort-on-the-Main or entrusted to me for study by other museums; for example, that of Geneva, Switzerland, which possesses Bourguignat's types, and the United States National Museum, where I have had the privilege of studying Lea's types of unionids from Asia Minor. The investigation of such authentic material often gave results quite different from those derived from the study of descriptions and figures; the attributions to synonymy to be found in my arrangement, therefore, often differ from those customary, and are the immediate consequence of personal acquaintance with the respective "species."

As to the position of the palearctic unionids within the general system of the family, my arrangement also differs from that of other writers, and even from that of Thiele in his *Handbuch der systematischen Weichtierkunde*. In many cases I have no anatomical evidence, and I trust that my system may be attributed to special acquaintance with the subject; paleontological data have frequently influenced my ideas upon the relationships between palearctic and exotic genera.

The following arrangement is only a tentative one. In France, where Bourguignat's influence prevailed up to the beginning of this century, Germain in his *Mollusques terrestres et fluviatiles de la France* (**22**, Part 2: Faune de France, Paris, 1931) reduces the number of French unionids to a very few fundamental species. It is thus evident that the endeavor to simplify and to concentrate the system is everywhere obvious. Since others have ideas similar to mine, they may perhaps welcome my arrangement as a basis for future and more extensive research.

Finally, I must try to explain my concept of a "subspecies" or a "local race," in order to justify my arrangement. I realize that, in many cases, it is very difficult to distinguish two neighboring local races, as they seemingly are linked by intermediate forms. The impossibility of a sharp separation may be due to overlappings at the borders of distribution or, possibly, to hybridizations; but in all

such cases, the respective subspecies are more easily distinguishable at the centers than at the borders of their areas. Something of the same kind, only on a much smaller scale, also happens to adjacent full species; for instance, to *Unio pictorum* Linnaeus and *Unio elongatulus* C. Pfeiffer, which can scarcely be distinguished in eastern France, where there are certainly hybridizations between them.

In cases such as these, the distinction between species or subspecies is very difficult, and I have usually based my decisions upon the shape of the shells found in the centers of the areas of distribution in question. I am well aware of the tentative character of such an arrangement; larger series of material from new localities may necessitate much revision of the system set forth in this paper.

The present paper recognizes 9 genera, 19 species, and 61 subspecies of palearctic unionids.

TENTATIVE ARRANGEMENT OF THE PALEARCTIC UNIONIDS INTO NATURAL GROUPS

Family **Margaritiferidae**

The palearctic margaritiferids all belong to the genus *Margaritifera* Schumacher; the following species or specific groups are known:

Genus **Margaritifera** Schumacher, 1816

Margaritana Schumacher, 1817 — *Pseudunio* Haas, 1910
Potamida Swainson, 1840

Margaritana syriaca Pallary, 1929, is clearly a *Psilunio*. See under *Psilunio littoralis homsensis* Lea, page 135.

Margaritifera auricularia Spengler, 1793

Margaritifera auricularia auricularia Spengler, 1793

Unio sinuatus Lamarck, 1819 — *Unio margaritanopsis* Locard, 1889

Iberian Peninsula; France; Po basin in North Italy. Subfossil in England (Thames); Germany (Thuringia, Rhine basin); central Italy.

Margaritifera auricularia maroccana Pallary, 1920

Margaritana redomica Pallary, 1927 — *Margaritana dernaica* Pallary, 1928

Very closely related to typical *auricularia*, but probably distinguishable as a local race.

Morocco.

Margaritifera margaritifera Linnaeus, 1758

A holarctic species, represented in the palearctic region by the following four subspecies:

Margaritifera margaritifera margaritifera Linnaeus, 1758

Unio elongata Lamarck, 1819
Unio roissyi Michaud, 1831
Unio margaritifer var. *minor* Rossmaessler, 1835
Unio brunneus Bonhomme, 1840
Unio tristis Morelet, 1845
Margaritana freytagi Kobelt, 1886
Margaritana michaudi Locard, 1889
Margaritana pyrenaica Bourguignat, 1889
Margaritana alleni Castro in Locard, 1889
Margaritana margaritifera parvula Haas, 1908
Margaritana durrowensis Phillips, 1928

Part of the names quoted in the synonymy designate incipient races which have no status in modern nomenclature.

Extra-mediterranean Europe.

Margaritifera margaritifera dahurica Middendorff, 1851

Eastern Siberia.

Margaritifera margaritifera middendorffi Rosen, 1926

Unio complanatus Middendorff (not Solander) 1851

Kamchatka.

Margaritifera margaritifera laevis Haas, 1910

Margaritana dahurica Kobelt (not Middendorff), 1879
Ptychorhynchus laevis Haas, 1910
Margaritana sachalinensis Shadin, 1938

Saghalin; northern Japan.

Family **Unionidae**

Subfamily **Unioninae**

Some of the genera grouped here, such as *Leguminaia, Pseudodontopsis* and *Microcondylaea,* the anatomy of which is entirely unknown or only partly known, may not belong to this subfamily at all.

Genus **Unio** Retzius, 1788

Palearctic, entering into the Oriental region just in the East and the Southeast; closely related to the nearctic genus *Elliptio* Rafinesque.

Unio pictorum Group

Very similar and probably related to the East-Asiatic *Unio douglasiae* Griffith and Pidgeon and its group.

Unio pictorum Linnaeus, 1758

Palearctic region, except the Mediterranean basin, where it is found only in the Rhone system, in North Africa and in the rivers flowing into the Black Sea. In the parts of the Mediterranean basin where it is absent, it is represented by the races of *Unio elongatulus* C. Pfeiffer. In the Rhone system as well as in North Africa, both species occur side by side; in central France (Rhone basin and rivers of the central plain) they apparently hybridize, for the unios of the *pictorum* group are intermediate between these two forms and are distinguished by extreme variability.

Unio pictorum pictorum Linnaeus, 1757

Unio limosus Nilsson, 1882
Unio deshayesi Michaud, 1832
Unio pictorum var. *grandis* Rossmaessler, 1842
Unio maltzani Kuster, 1854
Unio pictorum var. *niger* Joannis, 1858
Unio platyodon Jordan, 1879
Unio jousseaumi Bourguignat, 1882
Unio pincianus Bourguignat, 1882
Unio dolfussianus Bourguignat, 1882
Unio joannisi Bourguignat, 1882
Unio gallicus Bourguignat, 1882
Unio cancrorum Bourguignat, 1882
Unio rhynchetinus Letourneux, 1882
Unio rostratellus Bourguignat, 1882
Unio torsatellus Berthier, 1882
Unio hollandrei Bourguignat, 1882
Unio fascellinus Servain, 1882
Unio falsus Bourguignat, 1882
Unio strigatus Servain, 1886
Unio caravellus Servain, 1887
Unio lesumicus Bourguignat, 1888
Unio subbalatonicus Servain, 1888
Unio brebissoni Locard, 1889
Unio campylus Locard, 1889
Unio siliquiformis Locard, 1889
Unio macropisthus Bourguignat, 1889
Unio hospitali Locard, 1889
Unio oesiacus Locard, 1889
Unio rectus Locard, 1890
Unio battonensis Kobelt, 1896

The synonymy of this and the following races is still very much confused, especially for the French forms. It was due to their variability that so many "species" and "varieties" were described in France. They could not be interpreted by Germain (1931). Hence the list of synonyms is neither correct nor complete.

Atlantic northern and central and northwestern Europe; apparently hybridizing with *Unio elongatulus* C. Pfeiffer in eastern France.

Unio pictorum praeposterus Küster, 1854

Naab; Regen; Thaya (Danube system).

Unio pictorum latirostris Küster, 1854

Unio concinnus Küster, 1840 (nomen nudum)
Unio quinqueannulatus Küster, 1854
Unio arca Held in Küster, 1854
Unio decollatus Held in Küster, 1854
Unio baletonicus Küster, 1861
Unio balatonicus Servain, 1881
Unio dubreuili Servain, 1881
Unio eucallistus Kobelt, 1915

Haas and Schwarz (1913) regard *U. quinqueannulatus* as a hybrid between *U. pictorum latirostris* and its northern neighbor *U. pictorum pictorum*.

German Danube; Hungary; entering into the Save system.

Unio pictorum platyrhynchus Rossmaessler, 1835

Unio longirostris Rossmaessler, 1836
Unio ponderosus Spitzi in Rossmaessler, 1842
Unio graniger J. F. Schmidt, 1847

Styria; Carinthia; Carniolia (Danube system).

Unio pictorum middendorffii Westerlund, 1890

Eastern Siberia, still in the Amur River.

Unio pictorum schrenckianus Clessin, 1880

Unio pictorum var. *okae* Kobelt, 1911
Unio annulatus Kobelt, 1912
Unio pictorum schrenckianus var. *dicki* Modell, 1930
Unio lindholmi Shadin, 1938
Unio pictorum var. *okensis* Shadin, 1938
Unio pictorum var. *pygmaeus* Shadin, 1938
Unio pictorum var. *defectivus* Shadin, 1938

Pontic Russia.

Unio pictorum ascanius Kobelt, 1913

Northern Asia Minor.

Unio pictorum proëchistus Bourguignat, 1870

Rumanian Danube; Vardar River(?)

Unio pictorum gaudioni Drouët, 1881

Unio gentilis Haas, 1911

Doiran Lake, Macedonia; Maritza River; Varna, Bulgaria; vicinity of Istanbul.

(?)**Unio pictorum proëchus** Bourguignat, 1862

Unio actephilus Bourguignat, 1862

Lake Lucerne, Switzerland.

(?)**Unio pictorum moussonianus** Clessin, 1887

Lake Zug, Switzerland.

Unio pictorum rostratus Lamarck, 1819

The synonymy still being unsettled, the compilation is tentative:

Unio pictorum var. *vinceleus* Joannis, 1858
Unio pictorum var. *tumens* Joannis, 1858
Unio gestroianus Bourguignat, 1882
Unio charpyi Drouët, 1888
Unio lugdunicus Coutagne, 1889
Unio cristulatus Drouët, 1889
Unio perroudi Locard, 1889
Unio hydrellus Locard, 1889
Unio bramicus Baichère, 1890

Occasionally hybridizing with *Unio elongatulus* C. Pfeiffer, where they occur together.

Rhone system, France.

Unio pictorum platyrhynchoideus Dupuy, 1849

(?)*Unio michaudiana* Des Moulins, 1833
Unio requienii var. *crassidens* Rossmaessler, 1844 (not Lamarck, 1819)
Unio philippei Dupuy, 1849
Unio danielis Gassies, 1867
Unio moreleti Folin and Berillon, 1874 (not Deshayes, 1848)
Unio brindosianus Folin and Berillon, 1874
Unio baudoni Folin, 1874
Unio moreletianus Folin and Berillon, 1877
Unio moriscottei Folin, 1877
Unio bayonnensis Folin and Berillon, 1877
Unio berilloni Locard, 1882
Unio hauteriverianus Bourguignat, 1882
Unio corbini Bourguignat, 1882
Unio milne-edwardsi Bourguignat, 1882
Unio fagoti Bourguignat, 1883

Southwestern Atlantic France, including the Garonne River.

Unio pictorum mucidus Morelet, 1845

Unio nevesi Castro, 1885
Unio simoesi Castro, 1885
Unio cameratus Drouet, 1893
Unio limosellus Drouet, 1893
Unio decurtatus Drouet, 1893
Unio callipygus Drouet, 1893
Unio aeschrus Locard, 1899
Unio tameganus Locard, 1899
Unio onconensis Locard, 1899
Unio hypoxanthus Locard, 1899
Unio chorellus Locard, 1899
Unio chorellinus Locard, 1899
Unio submucidus Locard, 1899
Unio barbosanus Locard, 1899
Unio castroi Locard, 1899
Unio silvai Locard, 1899
Unio ocresanus Locard, 1899
Unio paulinoi Locard, 1899
Unio subhispanus Locard, 1899
Unio hyperephanus Locard, 1899
Unio chasmirhynchus Locard, 1899
Unio mundanus Locard, 1899
Unio euchasmus Locard, 1899
Unio schousboei Locard, 1899
Unio taganus Locard, 1899
Unio abrantesianus Locard, 1899
Unio scalabisianus Locard, 1899
Unio allenianus Locard, 1899
Unio cyrtus Locard, 1899
Unio sousanus Locard, 1899
Unio novus Locard, 1899
Unio neothaumus Locard, 1899

Northwestern part of Atlantic Iberian Peninsula.

Unio pictorum delphinus Spengler, 1793

Unio gibbus Spengler, 1793
Unio hispanus Rossmaessler, 1844
Unio dactylus Morelet, 1845
Unio lusitanus Drouët, 1879
Unio (*hispanus* var.?) *sevillensis* Kobelt, 1887
Unio hispanus var. *sphenoides* Westerlund, 1892
(?)*Unio gravatus* Drouët, 1893
Unio turdetanus Drouët, 1893
Unio taginus Kobelt, 1903

Southwestern part of Atlantic Iberian Peninsula.

Unio pictorum ravoisieri Deshayes, 1848

Unio atharsus Bourguignat, 1889

Mediterranean North Africa, including Tunisia in the east.

Further synonymy still unsettled.

Unio tigridis Bourguignat, 1852

Southwestern Asia.

Unio tigridis tigridis Bourguignat, 1852

Unio truncatus Swainson, 1829 (not Spengler, 1793)
Unio hueti Bourguignat, 1855
Unio natolicus Küster, 1856
Unio mussolianus Kuster, 1861
Unio rasus Lea, 1863
Unio mosulensis Lea, 1863
Unio bourguignatianus Lea, 1863
Unio dignatus Lea, 1863
Unio delicatus Lea, 1863
Unio tigris Lea, 1870
Unio anemprosthus Locard, 1883
Unio subtigridis Locard, 1883
Unio axiacus Locard, 1883
Unio chantrei Locard, 1883
Unio jouberti Locard, 1883
Unio antiochianus Locard, 1883
Unio kobelti Rolle, 1895
Unio tigridis var. *harunis* Kobelt, 1912
Unio dignatus semiramidis Kobelt, 1913
Unio dignatus assuricus Kobelt, 1913
Unio dignatus ninusi Kobelt, 1913
Unio hyperamblius Kobelt, 1913
Unio calliopsis Kobelt, 1913
Unio siouffi Kobelt, 1913
Unio schwarzii Kobelt, 1915

Syria, in the Orontes basin; Iraq; Lake Urmiah.

Unio tigridis terminalis Bourguignat, 1852

Unio grelloisianus Bourguignat, 1856
Unio grelloisianus var. *giganteus* Bourguignat, 1856
Unio lunulifer Bourguignat, 1856
Unio jordanicus Bourguignat, 1865
Unio pietri Locard, 1880
Unio lorteti Locard, 1880
Unio tristrami Locard, 1883
Unio ellipsoideus Locard, 1883
Unio genezarethanus Locard, 1883
Unio tiberiadensis Locard, 1883
Unio prosacrus Locard, 1883
Unio zabulonicus Locard, 1883
Unio herodes Kobelt, 1895
Unio kisonis Kobelt and Rolle, 1895

For this subspecies, Prashad (1919) has' introduced the subgeneric name of *Eolymnium*, apparently without sufficient reason.

Littoral rivers of Cilicia, Syria and Palestine; Jordan River.

Unio abyssinicus von Martens, 1866

†*Unio willcocksi* Newton, 1899
†*Unio vignardi* Pallary, 1924
†*Unio fayumensis* Pilsbry and Bequaert, 1927

Abyssinia; the subfossil forms (†) in the basin of the Lower Nile.

Unio elongatulus Group

Unio elongatulus C. Pfeiffer, 1825

Mediterranean region; Asia Minor.

Unio elongatulus elongatulus C. Pfeiffer, 1825

Unio lijacensis Kobelt, 1890
Unio lijacensis var. *gallensteini* Kobelt, 1890

Area north of the Adriatic Sea: Tagliamento River(?); basin of Isonzo River; northern Dalmatia(?)

Unio elongatulus pallens Rossmaessler, 1842

Unio viridiflavus Küster, 1854
Unio petterdianus Küster, 1854
Unio petrovichi Kuster, 1854
Unio nitidosus Drouët, 1879

Central and southern Dalmatia (Narenta, Imoshi); north Greece; River Save in Croatia(?)

Unio elongatulus fiscallianus Kleciach, 1872

Imoshi, Dalmatia; may turn out to be only a lacustrine form of *U. elongatulus pallens* Rossmaessler.

Unio elongatulus sandrii Rossmaessler, 1844

Unio nuperus Ziegler, in litt.
Unio sandrii var. *sericatus* Rossmaessler, 1844
Unio ceratinus Drouët, 1879
Unio dalmaticus Drouët, 1879
Unio succineus Drouët, 1881
Unio morlachicus Kobelt, 1915

Northern Dalmatia; may be identical with *Unio elongatulus pallens* Rossmaessler.

Unio elongatulus decipiens Drouët, 1881

Dalmatia; Montenegro. Possibly a lacustrine form of *Unio elongatulus pallens* Rossmaessler.

Unio elongatulus krüperi Drouët, 1879

Unio destructilis Villa in Kobelt, 1915

Montenegro; Lake Vrachori in Aetolia, Greece. This race may be only a degenerate form of *Unio elongatulus pallens* Rossmaessler.

Unio elongatulus quelleneci Drouët, 1895

Unio copaisanus Drouët, 1895

Lake Kopais, Aetolia, Greece; possibly a lacustrine form of *Unio elongatulus pallens* Rossmaessler.

Unio elongatulus bourgeticus Bourguignat, 1882

Unio sabaudianus Bourguignat, 1882
Unio riciacensis Bourguignat, 1882
Unio orthus Coutagne, 1882
Unio occidaneus Drouët, 1888
Unio mucidellus Bourguignat, 1889
Unio voltzii Kobelt, 1911
Unio voltzii var. *ursannensis* Kobelt, 1911

Basin of River Saone in western France; Swiss Jura; Savoy; introduced into the Rhine system (Mühlhausen) by means of the Rhine-Rhone Canal.

A very difficult and until recently little understood race, often confounded with forms of *Unio crassus* Retzius on account of its oval shape and wavy umbonal sculpture. The above list of synonyms is provisional.

Unio elongatulus turtoni Payraudeau, 1826

Unio capigliolo Payraudeau, 1826
Unio bandini Küster, 1837
Unio exauratus Locard, 1889

Corsica, Sardinia.

Unio elongatulus moquinianus Dupuy, 1843

Unio antimoquinianus Locard, 1889
Unio consentaneus var. *moquini* Germain, 1931

Hautes-Pyrénées; Basses-Pyrénées; southern France.

This race has also often been confounded with forms of *crassus.* The synonymy will certainly prove to be more extensive.

Unio elongatulus aleroni Companyó and Massot, 1865

Central southern France (Hérault, Aude, Pyrénées-Orientales, Tarn, Haute-Garonne, Ariège).

Unio elongatulus rousii Dupuy, 1849

Unio thermalis Dupuy, in litt.
Unio malafossianus Bourguignat, 1882

Southern France (Garonne, Gers). Often confounded with *Unio tumidus* Retzius; synonymy still incompletely known.

Unio elongatulus mancus Lamarck, 1819

Unio ardusianus Reyniès, 1843
Unio condatinus Letourneux, 1882
Unio mucidulus Bourguignat, 1882
Unio gobionum Bourguignat, 1882
Unio mongazonae Servain, 1887
Unio asticus Servain, 1887
Unio eutrapelus Servain, 1887
Unio oberthurianus Bourguignat, 1889
Unio arcuatulus Bourguignat, 1889
Unio amblyus Castro, 1889

A very variable, difficult form, often confounded with forms of *crassus;* occasionally hybridizes with *Unio pictorum* Linnaeus.

Central France, mainly basins of rivers Seine and Marne.

Unio elongatulus requienii Michaud, 1831

Unio jacquemini Dupuy, 1849
Unio saintsimonianus Fagot, 1882
Unio veillanensis Blanc, 1882
Unio orthellus Bérenguier, 1882
Unio jourdheuili Ray, 1882
Unio forojuliensis Bérenguier, 1882
Unio triffoiricus Bourguignat, 1885
Unio fabaeformis Bourguignat, 1889
Unio frayssianus Bourguignat, 1889
Unio meyrannicus Bourguignat, 1889
Unio aramonensis Locard, 1889
Unio vardonicus Locard, 1889
Unio talus Bourguignat, 1889
Unio souzanus Castro, 1889
Unio royanus Locard, 1889
Unio aegericus Locard, 1889
Unio mucidulinus Locard, 1889
Unio baicheri Locard, 1890
Unio arelatus Bourguignat, 1892

Further synonymy still unsettled, the above list not final.

Southeastern part of France, the Rhone, and east of the Rhone.

Unio elongatulus penchinatianus Bourguignat, 1865

Rivers of Mediterranean coast of northeastern Spain, to and including the Ebro.

Unio elongatulus valentinus Rossmaessler, 1854

Unio graellsianus Bourguignat, 1865
Unio courquinianus Bourguignat, 1865
Unio almenarensis Drouët, 1893

Rivers of Mediterranean coast of Spain, south of the Ebro; southern border unknown.

Unio elongatulus gargottae Philippi, 1836

(?)*Unio lobata* Jan, 1832
Unio aradae Philippi, 1844
Unio aradasii Kobelt, 1876
Unio benoiti Bourguignat, 1883
Unio monterosati Bourguignat, 1883
Unio bivonianus Bourguignat, 1883
Unio caficianus Bourguignat, 1883
Unio biformis Monterosato, 1896
Unio bitortus Monterosato, 1896
Unio bipartitus Monterosato, 1896
Unio ricconianus Monterosato, 1896
Unio cuspidatus Monterosato, 1896
Unio subindentatus Adami in Monterosato, 1896

Sicily.

Unio elongatulus lawleyanus Gentiluomo, 1868

Unio larderelianus Pecchioli, 1869
Unio romanus Kobelt, 1875
Unio cumensis Kobelt, 1880
Unio cumanus Kobelt, 1880
Unio pornae Bourguignat in Locard, 1880
Unio meretricis Bourguignat in Locard, 1880
Unio moltenii Adami, 1882
Unio umbricus Adami, 1882
Unio etruscus Drouët, 1883
Unio campanus Drouët, 1883
Unio meridionalis Drouèt, 1883
Unio latinus Bourguignat, 1883
Unio campsus Bourguignat, 1883
Unio uziellii Bourguignat, 1883
Unio pisanus Bourguignat, 1883
Unio gentiluomoi Bourguignat, 1883
Unio pecchiolii Bourguignat, 1883
Unio polii Drouët, 1883
Unio planci Drouët, 1883
Unio isseli Bourguignat, 1883
Unio d'Anconae Bourguignat, 1883

Peninsular Italy.

Unio elongatulus glaucinus Porro, 1838

Unio corrosus Villa, 1841
Unio spinellii Villa, 1852
Unio requienii var. *vulgaris* Stabile, 1859
Unio requienii var. *orilicnsis* Stabile, 1859
Unio requienii var. *blauneri* Stabile, 1859
Unio gestroianus Bourguignat, 1871
Unio villae Issel, 1871
Unio larius Drouët, 1879
Unio gurkensis Bourguignat, 1881
Unio brachyrhynchus Drouèt, 1881
Unio opisodartos Adami, 1882
Unio stephaninii Adami, 1882
Unio subcylindricus Drouët, 1883
Unio fluminalis Drouet, 1883
Unio delpretei Bourguignat, 1883
Unio gredleri Drouët, 1883
Unio minusculus Drouèt, 1883
Unio benacinus Drouët, 1883
Unio siliquatus Drouèt, 1883
Unio nitidus Drouët, 1883
Unio eucallistellus Bourguignat, 1883
Unio callichrous Bourguignat, 1883
Unio padanus Bourguignat, 1883
Unio strobeli Bourguignat, 1883
Unio pedemontanus Bourguignat, 1883
Unio longobardus Drouet, 1883
Unio brianteus Drouët, 1883
Unio sabiniensis Bourguignat, 1883
Unio verbanicus Bourguignat, 1883
Unio athesinus Adams, 1885
Unio ruffonii Kobelt, 1886
Unio humerosus Westerlund, 1890
Unio humerosus var. *costanus* Tiesenhausen, 1894
Unio directus Drouët, 1895
Unio palustris Drouët, 1895
Unio humerosus var. *elongata* Kobelt, 1915
Unio humerosus var. *roboretana* Kobelt, 1915
Unio destructilis Villa in Kobelt, 1915

Basin of the Po, and Adige, continental Italy.

Unio elongatulus eucirrus Bourguignat, 1857

Unio raymondi Locard, 1883
Unio alexandri Kobelt and Rolle, 1895
Unio cilicicus Kobelt and Rolle, 1895
Unio cilicicus var. *adanensis* Rolle, 1895
Unio cilicicus var. *jenemterensis* Kobelt and Rolle, 1895
Unio cilicicus var. *subsaccatus* Kobelt and Rolle, 1895
Unio berythensis Kobelt and Rolle, 1895
Unio raymondopsis Kobelt, 1913
Unio kuweikensis Kobelt, 1913
Unio sesirmensis Kobelt, 1913
Unio (*cilicicus* var.) *anceyi* Kobelt, 1913

Littoral rivers of Cilicia, Syria, and Palestine.

Unio elongatulus dembeae Sowerby, 1865

Unio aeneus Jickeli, 1874
Unio jickelii Bourguignat, 1883
Unio alfierianus Bourguignat, 1885
Unio hamyanus Bourguignat, 1885
Unio ilqi Bourguignat, 1885
Unio meneliki Bourguignat, 1885
Unio soleilleti Bourguignat, 1885
Unio traversii Pollonera, 1888
Unio erlangeri Kobelt, 1909

Abyssinia.

Unio elongatulus durieui Deshayes, 1847

(?) *Unio emarginatus* Lea, 1834
Unio tafnanus Kobelt, 1884
Unio sitifensis Kobelt, 1884
Unio issericus Kobelt, 1884
Unio tetuanensis Kobelt, 1884
Unio medjerdae Kobelt, 1886
Unio micelii Kobelt, 1886
Unio delevieleusae Hagenmüller, 1887

After studying the type of *Unio emarginatus* Lea (U. S. Nat. Mus. No. 86159) I can not decide whether this form, known only by this type, is identical with *durieui* or not; the type specimen is composed of two odd valves.

Mediterranean North Africa.

Unio tumidus Group

Unio tumidus Retzius, 1788

Atlantic and Pontic parts of Europe.

Unio tumidus tumidus Retzius, 1788

Unio conus Spengler, 1793
Mya depressa Donovan, 1802
Mya ovata Donovan, 1802
Mya ovalis Montagu, 1803
Mysca solida Turton, 1822
Unio inflata Hecart, 1833
Unio mülleri Rossmaessler, 1838
Unio tumidus var. *saccatus* Rossmaessler, 1854
Unio pictorum var. *niger* Joannis, 1859
Unio tumidus var. *pictus* Beck in Moerch, 1864
Unio tumidus var. *maxima* Moerch, 1864
Unio tumidus var. *limicola* Moerch, 1864
Unio batavus var. *incurvatus* Colbeau, 1868
Unio tumidus var. *heckingi* Colbeau, 1868
Unio tumidus var. *rohrmanni* Kobelt, 1880
Unio bardus Bourguignat, 1881
Unio edyus Bourguignat, 1882
Unio alpecanus Bourguignat, 1882

Unio fourneli Bourguignat, 1882
Unio mulierum Servain, 1882
Unio schroederi Bourguignat, 1885
Unio rhenanus Kobelt, 1886
Unio tumidus var. *godetiana* Clessin, 1887
Unio tumidulus Locard, 1889
Unio aldemaricus Bourguignat, 1889
Unio giberti Locard, 1889
Unio rothomagensis Locard, 1890
Unio albovicensis Locard, 1893
Unio lacrymiformis Locard, 1893
Unio levoituricri Locard, 1893
Unio lauterborni Haas, 1909

Even the brief synonymy of this widespread form is still unsettled, since it is known that it has often been confounded with short, stout forms of *Unio pictorum* Linnaeus.

Atlantic western and central Europe.

Unio tumidus borysthenensis Kobelt, 1880

Unio gerstfeldtianus Clessin, 1880
Unio tumidus var. *falcatulus* Drouet, 1881
Unio tumidus ilekensis Kobelt, 1912
Unio tumidus var. *natermanni* Honigmann, 1914
Unio tumidus var. *bashkiricus* Shadin, 1938
Unio tumidus var. *moltshanovi* Shadin, 1938
Unio tumidus var. *fridmani* Shadin, 1938
Unio kobeltianus Shadin, 1938 (not Haas, 1913)

European streams draining into the Black Sea: lower part of Danube system; southern Russia.

Unio crassus Group

The members of this group have often been confounded with elongated forms of *Psilunio* and with round forms of *Unio elongatulus.*

Unio crassus Retzius, 1788

Unio crassus crassus Retzius, 1788

Unio musivus Spengler, 1793
Unio ater Nilsson, 1822
Unio rubens Menke, 1828
Unio rugatus Menke, 1828
Unio crassus var. *maximus* Kobelt, 1872
Unio pseudolittoralis Clessin, 1875
Unio kochi Kobelt, 1886
Unio hamburgiensis Servain, 1888
Unio pseudolittoralis var. *curonicus* Riemenschneider, 1907
Unio crassus heimburgi Haas, 1911
Unio crassus thuringiacus Israel, 1917
Unio crassus polonicus Polinski, 1917
Unio crassus ornatus Polinski, 1917
Unio crassus var. *ishnensis* Shadin, 1938

North Europe; Atlantic Central Europe, in the west to the Rhine, but not in it; Atlantic and boreal Russia.

Unio crassus cytherea Küster, 1833

(?)*Unio planus* Studer, 1820; unidentifiable
Unio sinuatus Studer, 1820 (nomen nudum)
Unio dilatatus Studer, 1820 (nomen nudum)
Unio ovatus Studer, 1820 (nomen nudum)
Unio sinuolata Küster, 1833
Unio dubius Fitzinger, 1833 (nomen nudum)

Unio nigricans Fitzinger, 1833 (nomen nudum)
Unio castaneus Fitzinger, 1833 (nomen nudum)
Unio decurvatus Rossmaessler, 1835
Unio labacensis Rossmaessler, 1835
Unio vitreus Rossmaessler, 1835
Unio atrovirens Rossmaessler, 1836
Unio amnicus Rossmaessler, 1836
Unio piscinalis Rossmaessler, 1836
Unio reniformis Rossmaessler, 1836
Unio consentaneus Rossmaessler, 1836
(?)*Unio retusa* Held, 1836
Unio batavus var. *gibbosus* Held, 1836
Unio batavus var. *elongatus* Held, 1836
Unio carinthiacus Rossmaessler, 1836
Unio fusculus Rossmaessler, 1836
Unio squamosus Charpentier, 1837
Unio gangraenosus J. F. Schmidt, 1840
Unio pruinosus J. F. Schmidt, 1840
Unio nessorhynchus Küster, 1854
Unio heldii Kuster, 1854
Unio bosnensis von Moellendorff, 1873
Unio phaseolus Held in Kobelt, 1879
Unio neocomensis Drouet, 1881
Unio croaticus Drouët, 1881
Unio striatulus Drouët, 1882
Unio truncatulus Drouet, 1883
Unio rivalis Drouet, 1884
Unio serbicus Drouet, 1884
Unio savensis Drouet, 1884
Unio dokiči Drouet, 1884
Unio ondovensis Hazay, 1885
Unio albensis Hazay, 1885
Unio subrobustus Servain, 1885
Unio duregicus Servain, 1885
Unio sandriopsis Servain, 1885
Unio ostiorum Servain, 1885
Unio turicus Servain, 1885
Unio tiguricus Servain, 1885
Unio travnicensis Kobelt, 1910
Unio brandisi Kobelt, 1910
Unio consentaneus hohenwarti Kobelt, 1910
Unio langi Kobelt, 1910
Unio (*consentaneus* var.?) *gallensteini* Kobelt, 1910
Unio consentaneus subterminalis Kobelt, 1910
Unio batavus elongatus Clessin, 1910
Unio consentaneus thayacus Kobelt, 1910
Unio consentaneus biaudeti Kobelt, 1911
Unio consentaneus bodamicus Kobelt, 1911
Unio consentaneus dilatatus Kobelt, 1911
Unio consentaneus abnobae Kobelt, 1911

May hybridize with the Atlantic *U. c. batavus.*

Rhone basin to and inclusive of Lake Geneva; Swiss Rhine and tributaries; Danube system; Galicia; Wardar River.

Unio crassus batavus Maton and Rackett, 1807

Unio nana Lamarck, 1819
Unio riparia C. Pfeiffer, 1821
Unio arcuatus Bouch.-Chant., 1838
Unio droueti Dupuy, 1849
Unio courtillieri Hatteman, 1859
Unio batavus var. *minimus* Joannis, 1859
Unio batavus var. *baraceus* Joannis, 1859
Unio lamboltei Malzine, 1867
Unio subtilis Drouët, 1879
Unio ligericus Bourguignat, 1882
Unio dubisianus Coutagne, 1882
Unio sequanicus Coutagne, 1882
Unio rayi Bourguignat, 1882
Unio pilloti Bourguignat, 1882
Unio crassatellus Bourguignat in Locard, 1882
Unio socardianus Bourguignat in Locard, 1882
Unio locardianus Bourguignat in Locard, 1882
Unio lagnysiacus Locard, 1882
Unio macrorhynchus Bourguignat, 1882
Unio melas Coutagne, 1882
Unio dubisianopsis Locard, 1882
Unio carantoni Coutagne, 1882
Unio minutulus Ray, 1882
Unio berthellini Bourguignat, 1882
Unio andegavensis Servain, 1882
Unio cyprinorum Berthier, 1882
Unio matronicus Bourguignat, 1882
Unio septentrionalis Bourguignat, 1882
Unio oxyrhynchus Brevière, 1882
Unio marcellinus Berthier, 1882
Unio potamius Bourguignat, 1882
Unio feliciani Bourguignat, 1882
Unio arenarum Bourguignat, 1882
Unio danemorae Bourguignat, 1882
Unio brevieri Bourguignat, 1882
Unio tumidiformis Castro, 1885
Unio sadoicus Castro, 1885

Unio macropygus Castro, 1885
Unio eupygus Castro, 1885
Unio batavellus Letourneux, 1885
Unio batavus var. *taunica* Kobelt, 1886
Unio baeticus Kobelt, 1887
Unio carcasinus Souverbie, 1887
Unio besnardianus Servain, 1888
Unio baudoni Folin, 1888
Unio crassulus Drouet, 1888
Unio vegesackensis Servain, 1888
Unio visurgisinus Servain, 1888
Unio badiellus Drouet, 1888
Unio catalaunicus Coutagne, 1889
Unio zoasthenicus Locard, 1889
Unio jurianus Locard, 1889
Unio subamnicus Locard, 1889
Unio aturicus Locard, 1889
Unio lemotheuxi Servain, 1889
Unio orbus Locard, 1889
Unio andeliacus Bourguignat, 1889
Unio vallieriacus Bourguignat, 1889
Unio nubilus Locard, 1889
Unio diptychus Surrault, 1889
Unio ingrandiensis Surrault, 1889
Unio materniacus Locard, 1889
Unio melantatus Bourguignat, 1889
Unio balbignyanus Bourguignat, 1889
Unio occidentalis Bourguignat, 1889
Unio stygnus Locard, 1889
Unio bouchardi Bourguignat, 1889
Unio passavanti Bourguignat, 1889
Unio surraulti Servain, 1889
Unio adonus Servain, 1889
Unio camonti Bourguignat, 1889
Unio hattmanni Bourguignat, 1889
Unio senauxi Bourguignat, 1889
Unio visurgicus Servain, 1889
Unio cariolicensis Pacôme, 1889
Unio mariae Pacôme, 1889
Unio nicolloni Locard, 1889
Unio euthymeanus Locard, 1889
Unio ignariformis Bourguignat, 1889
Unio ignari Bourguignat, 1889
Unio manculus Locard, 1889
Unio perroudi Locard, 1889
Unio scotinus Locard, 1889
Unio redactus Locard, 1889
Unio conimbricus Kobelt, 1893
Unio gliscerus Locard, 1893
Unio ampullaceus Locard, 1893
Unio chardoni Bourguignat in Locard, 1893
Unio lancelevei Locard, 1893
Unio hassiae Haas, 1908
Unio pseudocrassus Haas, 1909
Unio batavus sabulosus Haas, 1910
Unio batavus badensis Haas, 1910
Unio batavus palatinus Haas, 1911
Unio batavus hexameri Haas, 1911
Unio batavus probavaricus Haas, 1911
Unio batavus distinguendus C. Boettger, 1912
Unio batavus navensis C. Boettger, 1912
Unio batavus kobeltianus Haas, 1913
†*Unio cantianus* Kennard and Woodward, 1924

This list is a first and incomplete attempt to gather the synonyms of this highly variable race.

Atlantic Iberian Peninsula; Atlantic France; western Germany, not including the Weser; subfossil in England.

Unio crassus carneus Küster, 1848

Unio luxurians Küster, 1848
Unio brevirostris Küster, 1848

Montenegro; Albania.

Unio crassus jonicus Drouët, 1879

Unio helenae Kobelt, 1893

Western Greece; isles of Corfu and Levkas.

Unio crassus gontieri Bourguignat, 1856

Unio colchicus Drouët, 1881
Unio sieversi Drouët, 1881
Unio stevenianus Drouët, 1881
Unio mingrelicus Drouët, 1881
Unio raddei Drouët, 1881
Unio araxenus Drouët, 1881
Unio stepanovi Drouët, 1881
Unio raddei var. *kutaisanus* Kobelt, 1886
Unio crassus okae Kobelt, 1911
Unio kungurensis Kobelt, 1912

Unio kungurensis var. *irenjensis* Kobelt, 1912
Unio kungurensis var. *sylvensis* Kobelt, 1912
Unio kungurensis var. *chlebnikowi* Kobelt, 1912
Unio armeniacus Kobelt, 1912
Unio roseni Kobelt, 1912
Unio gregorii Kobelt, 1912
Unio subbatavus Kobelt, 1913
Unio mingrelicus var. *steveniani-formis* Shadin, 1938

This subspecies has been cited as *stevenianus* Krynicki, 1837, but this name remained a nomen nudum until 1881, and *gontieri*, dating from 1856, has priority.[1]

Caucasus; Basin of River Kama; White Russia.

Unio crassus bruguierianus Bourguignat, 1853

Unio orientalis Bourguignat, 1852 (not Lea, 1840)
Unio prusii Bourguignat, 1853
Unio vescoi Bourguignat, 1856
Unio schwerzenbachi Bourguignat, 1856
Unio turcicus Kuster, 1862
Unio kotschyi Küster, 1862
Unio damascensis Lea, 1863
Unio orontesensis Lea, 1863
Unio syriacus Lea, 1863
Unio orphaensis Lea, 1864
Unio mardinensis Lea, 1864
Unio kullethensis Lea, 1864
Unio vicarius Westerlund, 1879
Unio desectus Westerlund, 1879
Unio heldreichi O. Boettger, 1886
Unio thiesseae Drouet, 1892
Unio scissus Drouët, 1893
Unio pseudonymus Simpson, 1900
(?)*Unio modiola* Preston, 1912
Unio specialis Kobelt, 1913
Unio ancyrensis Kobelt, 1913
Unio ancyrensis var. *louisei* Kobelt, 1913
Unio orphaensis var. *ehrmanni* Kobelt, 1913
Unio diarbekrianus Kobelt, 1913
Unio bitlisensis Kobelt, 1913
Unio ciconius Kobelt, 1913
Unio medicus Kobelt, 1913
Unio thospiensis Kobelt, 1915
Unio (*Rhombunio*) *wenzi* Kobelt, 1915

Eastern Greece; Asia Minor.

Unio crassus mongolicus Middendorff, 1851

Known only from Middendorff's original description. Preston (1912) cited it from the upper Indus River, but this information does not seem to be reliable.

Amur River System, northeastern Asia.

The three genera which now follow, i.e. *Leguminaia*, *Pseudodontopsis* and *Microcondylaea*, are only intuitively grouped with the Unionines, since anatomical evidence is not yet available. The three genera cited above are close relatives of the genus *Pseudodon* Gould, which is now restricted to southeastern Asia, though it ranged much farther westward in late Tertiary time.

[1] *Unio steveniana* Krynicki, Bull. soc. imp. nat. Moscou, **10**, p. 59, 1837 (nomen nudum); Siemaschko, Bull. soc. imp. nat. Moscou, **22**, p. 126, 1847 (nomen nudum); *Unio gontieri* Bourguignat, Aménités Malacologiques, **2**, p. 33, pl. 4, figs. 1–4, 1856; *Unio stevenianus* Drouët, Union. Russie Europ., p. 14, 1881 (first description of species).

Genus **Leguminaia** Conrad, 1865

Leguminaia wheatleyi Lea, 1862

Monocondylaea mardinensis Lea, 1864
Leguminaia chantrei Locard, 1883
Leguminaia bourguignati Locard, 1883
Leguminaia naegeli Kobelt, 1913
Leguminaia graeteri Kobelt, 1913
Leguminaia nisibina Kobelt, 1913
Leguminaia haasi Kobelt, 1915

Iraq; Kara-su in Syria; Lake Antioch, Syria.

Leguminaia saulcyi Bourguignat, 1852

Unio michonii Bourguignat, 1852
Unio tripolitanus Bourguignat, 1852
Pseudodon chantrei Locard, 1883
Leguminaia locardi Simpson, 1900

Germain (1911) has created a new subgenus *Pseudoleguminaia* for this species, which is characterized by oval shape, but I am unwilling to recognize it.

Lake Antioch; rivers of Syrian littoral to the Nahr-el-Audja near Jaffa in the south.

Genus **Pseudodontopsis** Kobelt, 1913

Pseudodontopsis euphraticus Bourguignat, 1852

Unio opperti Bourguignat, 1856
Pseudodon churchillianus Bourguignat, 1857
Monocondylaea rhomboidea Lea, 1859
Pseudodon pachyolenus Bourguignat, 1881 (nomen nudum)
Pseudodontopsis piestius Kobelt, 1913
Pseudodontopsis babylonicus Kobelt, 1913

Iraq; *churchillianus* is said to come from Konieh.

Genus **Microcondylaea** von Vest, 1866

Microcondylaea compressa Menke, 1830

(?)*Anodonta uniopsis* Lamarck, 1819; unidentifiable
Unio depressa C. Pfeiffer, 1825 (not Lamarck, 1819)
Unio bonellii Férussac in Rossmaessler, 1835
Unio bonellii var. *curvata* Rossmaessler, 1835
Unio moreleti Drouet, 1879
Microcondylus crassus Drouët, 1879
Microcondylus gibbosus Drouët, 1879
Microcondylus squamosus Drouët, 1879
Microcondylus truncatus Drouët, 1879
Microcondylaea servaini Bourguignat, 1883
Microcondylaea doriae Bourguignat, 1883
Microcondylaea gestroi Bourguignat, 1883
Leguminaia pedemontana Pollonera, 1889
Leguminaia craverii Pollonera, 1889
Microcondylaea bonellii f. *parisii* Kobelt, 1913
Microcondylaea bonellii f. *levicensis* Kobelt, 1913
Pseudanodonta depressa var. *augusti* Graziadei, 1933

Po basin; Adige basin; littoral rivers east of Adige to and comprising the Isonzo.

Subfamily **Quadrulinae**

This holarctic subfamily has only one representative in the palearctic region at the present time, *Psilunio* Stefanescu; but in the Pliocene there were more quadruline genera in Europe, which were closely related to the modern east-Asiatic genera *Cuneopsis* Simpson and *Lamprotula* Simpson. The center of distribution of the quadrulines is North America.

The quadruline nature of *Psilunio* was proved by the study of its anatomy (Haas, 1920, 1924).

Genus **Psilunio** Stefanescu, 1896

Rhytia Stefanescu, 1896
Rhombunio Germain, 1911

Psilunio acarnanicus Kobelt, 1879

Unio acarnanicus var. *messenicus* Westerlund, 1879
Unio pamisinus Drouet, 1894

Western Greece, in Lake Vrachori; in Messenia and in the Eurotas River.

Psilunio littoralis Lamarck, 1801

Psilunio littoralis littoralis Lamarck, 1801

Unio brevialis Lamarck, 1819
Unio subtetragonus Michaud, 1831
Unio draparnaldii Deshayes, 1831
Unio pianensis Farines, 1833
Unio cuneatus Jacquemin, 1835
Unio rotundatus Mauduyt, 1839
Unio barraudi Bonhomme, 1840
Unio bigerrensis Millet, 1843
Unio moulinsianus Dupuy, 1850
Unio astierianus Dupuy, 1850
Unio rhomboideus Moquin-Tandon, 1855
Unio unduliferus Küster, 1861
Unio subreniformis Bourguignat, 1863
†*Unio hippopotami* Bourguignat, 1869
Unio rathymus Bourguignat in Locard, 1882
Unio gandiensis Drouet, 1888
Unio pacomei Bourguignat in Locard, 1889
Unio circulus Bourguignat in Locard, 1893
Unio sphaericus Bourguignat in Locard, 1893
Unio ovuliformis Locard, 1893
Unio rhysopygus Drouet, 1894
Unio circinatus Drouet, 1894
Unio mauduyti Germain, 1897
Unio littoralis var. *taginus* Kobelt, 1903
†*Unio kinkelini* Haas, 1910
Unio batavus catalonicus Haas, 1921

Subfossil in the Rhine basin and in South England; recent in France, Iberian Peninsula with the exception of the southern part.

Psilunio littoralis umbonatus Rossmaessler, 1844

(?) *Unio incurvus* Lea, 1831; said to have come from Gibraltar, unidentifiable
Unio hispalensis Kobelt, 1887
Unio calderoni Kobelt, 1887
Unio calderoni var. *salvadori* Westerlund, 1892

Southern part of Iberian Peninsula.

Psilunio littoralis komarowi O. Boettger, 1880

Armenia.

Psilunio littoralis semirugatus Lamarck, 1819

Unio rothi Bourguignat, 1863
Unio emesaensis Lea, 1864
Unio simonis Tristram, 1865
Unio timius Bourguignat in Locard, 1883
Unio galilaei Locard, 1883
Unio luynesi Locard, 1883
Unio rhomboidopsis Locard, 1883
Unio tinctus Drouet, 1893
Unio rollei Kobelt, 1895
Unio graeferi Kobelt, 1913
Unio babensis Kobelt, 1913
Unio naegelei Kobelt, 1913
Unio beroeus Kobelt, 1913
Unio halepensis Kobelt, 1913
Unio halepensis var. *cazioti* Kobelt, 1913
Unio corbiculiformis Kobelt, 1913
Unio chinnerethensis Preston, 1913
Unio salamboana Pallary, 1929

Syria; Jordan basin in Palestine.

Psilunio littoralis homsensis Lea, 1864

Unio episcopalis Tristram, 1865
Unio barroisi Drouet, 1893
Margaritana syriaca Pallary, 1929

"*Margaritana*" *syriaca* is an unmistakable *Psilunio*, in spite of its elongated, ear-shaped shell; this becomes evident by the umbonal sculpture, the hinge, the roundish juvenile shell, the deep umbonal cavity, and other characters, and Pallary (1929) quite inadequately arranged it with *Margaritana* (=*Margaritifera*). It is by no means impossible that *homsensis* Lea can not be retained as a separate subspecies, but has to be united with *semirugatus*, of which it may be a rather extraordinarily elongated form. *Unio tinctus* Drouët, living together with *homsensis* in the Orontes River, combines a rounded, typical *Psilunio* shape of the shell with the purple nacre, by which *homsensis* is characterized. *Unio modiola* Preston, 1912, which I place with *Unio crassus bruguierianus* Bourguignat, may as well belong to *homsensis;* its description is too poor to make possible a decision on this point.

Orontes River, Syria.

Psilunio littoralis delesserti Bourguignat, 1853

Unio ferussacianus Lea, 1868
Unio wagneri Kobelt, 1895
Unio tracheae Kobelt, 1895
Unio lycicus Kobelt, 1895
Unio deschampsi Kobelt, 1913
Unio langloisi Kobelt, 1913
Unio abrus Kobelt, 1913
Unio blanchianus Kobelt, 1913

Littoral rivers of Palestine.

Psilunio littoralis fellmanni Deshayes, 1847

Unio ravoisieri Deshayes, 1847
Unio moreleti Deshayes, 1847
Unio unduliferus Küster, 1861
Unio maccarthyanus Bourguignat, 1866
Unio mauritanicus Bourguignat, 1868
Unio ksibianus Mousson, 1873
Unio jolyanus Bourguignat in Kobelt, 1886

Unio zenaticus Letourneux in Bourguignat, 1887
Unio rouirei Bourguignat, 1887
Unio marteli Pallary, 1918
Unio rhomboideus var. *bucheti* Pallary, 1921
Unio tifleticus Pallary, 1927
Rhombunio asananus Pallary, 1928

Unio unduliferus Küster (Martini-Chemnitz, 9, pt. 2, Unio, p. 162, pl. 46, fig. 4, 1861) described as probably of South American origin, certainly belongs here.

North Africa.

Subfamily **Anodontinae**

Contains the holarctic genus *Anodonta;* also *Pseudanodonta,* which is a close relative of the Asiatic genus *Pilsbryoconcha,* and *Gabillotia,* a European endemism.

Genus **Anodonta** Lamarck, 1799

Anodonta cygnea Group

Anodonta cygnea Linnaeus, 1758

Under this name I combine all the palearctic anodontas, with one exception, which will be mentioned below. The enormous plasticity and variability of the *Anodonta* shell have led to the proposal of many hundreds of specific names, in which not only Bourguignat and his school have shared; for even conscientious scientists of the other camp have again and again been induced by apparently characteristically shaped pond-mussels, to propose new names, being convinced of having separable species or, at least, local races before them.

There is only one—or, according to the most modern researches, two—fundamental species of *Anodonta* in the palearctic region, to which all the many different-looking "species" that have been described can be reduced. I myself, when beginning my studies on unionids in 1910, was inclined to recognize two such fundamental species, the broader *Anodonta cygnea* and the more elongated *Anodonta cellensis* Schroeter. This point of view I have meantime abandoned; it is at present maintained by Franz in Jena, and by his school, who recognize *Anodonta cygnea* and *Anodonta piscinalis* Nilsson as fundamental species. I am of the opinion that all the palearctic anodontas belong to one unique species, with the exception above indicated. It is worth mentioning that Clessin also arrived at the same conviction; he described an *Anodonta mutabilis* which was to comprise all the palearctic pond-mussels, including even their typical Linnaean species, *cygnea.*

Anodonta cygnea, as it is here understood, lives throughout the palearctic region. In northern and central Europe, it is a relatively common species, but becomes less so in the Mediterranean basin, is scarce in North Africa and in Asia Minor, and is only locally known from central Asia; for instance, from Samarkand (*samarkandensis* Kobelt), Buchara (*sogdiana* Kobelt, *bactriana* Rolle), the Seisan-Nor (*seisanensis* Kobelt), the Lena River (*lenae* Shadin), Lake Baikal (*sorensiana* Dybowsky, *sorica* Dybowsky) and its tributary, the Selenga River (*nova* Dybowsky, *selengensis* Dybowsky).

Pallary has described (1933) a subgenus *Euphrata*, based upon *Anodonta bahlikiana* (nomen nudum) from Mesopotamia, and Bédé has created (1932) another subgenus, *Liouvillea*, which rests on his Moroccan species *pallaryi* and *théryi*. Not having seen them, I cannot form a judgment of them; but knowing Pallary's tendency to publish new names for merely phaenotypic mutations, I rather strongly suspect that both subgenera are founded upon environmentally shaped and only apparently separable forms of *Anodonta cygnea*.

As I am unwilling to give up this point of view, it is unnecessary for me to give a complete synonymic list of *Anodonta cygnea*. The anodontas contained in Westerlund's *Fauna* constitute such a list up to 1890, and the following enumeration includes only such "species" as have been described since that date.

Anodonta ataxia Baichère, 1891
Anodonta coloxiana Nicolas, 1891
Anodonta suevica Kobelt, 1891
Anodonta borealis Kobelt, 1891
Anodonta recurvirostris Kobelt, 1892
Anodonta gallensteini Kobelt, 1892
Anodonta graeca Drouet, 1892
Anodonta quellenneci Drouet, 1892
Anodonta lepida Drouet, 1892
Anodonta lhotelleri Drouet, 1892
Anodonta discoidea Drouet, 1893
Anodonta baudoniana Drouet, 1893
Anodonta planulata Drouet, 1893
Anodonta viridiflava Drouet, 1893
Anodonta macella Drouet, 1893
Anodonta lanceolata Drouet, 1893
Anodonta limbata Drouet, 1893
Anodonta laevigata Drouet, 1893
Anodonta retziana Drouet, 1893
Anodonta gregalis Drouet, 1893
Anodonta aeneolina Drouet, 1893
Anodonta pulchella Drouet, 1893
Anodonta fuliginea Drouet, 1893
Anodonta ervica Kobelt, 1894
Anodonta latirostris Drouet, 1894
Anodonta mollis Drouet, 1894
Anodonta adusta Drouet, 1894
Anodonta glaucina Drouet, 1894
Anodonta prasina Drouet, 1894
Anodonta nobilis Drouet, 1894
Anodonta bicolor Drouet, 1894
Anodonta valentina Drouet, 1894
Anodonta emacerata Drouet, 1894
Anodonta cilicica Kobelt, 1895
Anodonta simulans Drouet, 1895
Anodonta sogdiana Kobelt, 1896
Anodonta bactriana Rolle, 1897
Anodonta fedderseni Westerlund, 1898
Anodonta goesi Westerlund, 1898
Anodonta anura Westerlund, 1898
Anodonta apala Locard, 1899
Anodonta pelophila Locard, 1899
Anodonta simoesi Locard, 1899
Anodonta portensis Locard, 1899
Anodonta leprosa Locard, 1899
Anodonta retteri Drouet, 1899
Anodonta chivoti Germain, 1904
Anodonta bouvieri Rochebrune, 1904
Anodonta falcata var. *fluviatica* Rosen, 1905
Anodonta (*piscinalis* var.) *portulana* Kobelt, 1908

Anodonta piscinalis transsylvanica Haas, 1911
Anodonta seisanensis Kobelt, 1912
Anodonta anatina var. *circularis* Hilbert, 1912
Anodonta (*cyrea* var.) *samarkandensis* Kobelt, 1913
Anodonta piscinalis var. *sorica* Dybowsky, 1913
Anodonta complanata var. *sorensiana* Dybowsky, 1913
Anodonta nova Dybowsky, 1913
Anodonta cellensis var. *selengensis* Dybowsky, 1913
Anodonta waterstoni Tomlin, 1923
Anodonta jesseni Schlesch, 1926
Anodonta (*Liouvillea*) *pallaryi* Bédé, 1932
Anodonta (*Liouvillea*) *théryi* Bédé, 1932
Anodonta (*Euphrata*) *bahlikiana* Pallary, 1933 (nomen nudum)
Anodonta cygnea var. *armenica* Ovtshinnikov, 1935
Anodonta anatina var. *petshorica* Shadin, 1938
Anodonta anatina var. *lenae* Shadin, 1938
Anodonta piscinalis var. *volgensis* Shadin, 1938

The genus *Cristaria* Schumacher, so widely distributed in eastern Asia, does not form part of the actual palearctic fauna. Nevertheless, some lacustrine European *Anodonta cygnea* which have acquired the characteristic shell features of *Cristaria*, i.e., a symphynote shell and a kind of hinge composed of claustra, may be considered as convergent forms; so the Danubian *Anodonta cygnea*, upon which Bourguignat (1881) based his genus *Colletopterum*, those from Lake Balaton (Hungary), Lake Doiran (Macedonia), and from the Albufera de Valencia (Spain). But it must be emphasized that the shell features we just mentioned are genotypically anchored in *Cristaria* and only phaenotypically developed in lacustrine European *Anodonta cygnea*.

Anodonta woodiana Group

With this East-Asiatic species, to which the group of the North American *Anodonta grandis* Say, 1829, belongs, I place the following palearctic species:

Anodonta vescoiana Bourguignat, 1857

Anodonta vescoiana var. *mesopotamica* Mousson, 1874
Anodonta schlaeflii Mousson, 1874

Iraq. If Bourguignat's information, that his *Anodonta vescoiana* originated from Konieh, Asia Minor, is correct, then his *Anodonta apollonica* and *Anodonta taurica*, both coming from the Lake of Apollonia, Asia Minor, may belong to the *woodiana* group.

Genus **Pseudanodonta** Bourguignat, 1877

Upon this genus opinions still differ widely. While some scientists do not regard it even as a subgenus of *Anodonta*, I consider it as a separable genus, well characterized by its peculiar shape and by the features of its glochidium; it is most closely related to the genus *Pilsbryoconcha* Simpson of southeastern Asia. Quite in con-

trast with *Anodonta, Pseudanodonta* forms local races, but it is so variable that there is as yet no agreement about these local races or even about its fundamental species. Thus the arrangement given below will soon need amendment.

Pseudanodonta elongata Holandre, 1836

Anodonta grateloupiana Gassies, 1849
Anodonta grateloupiana var. *globosa* Gassies, 1849
Anodonta normandi Dupuy, 1849
Anodonta jobae Dupuy, 1849
Anodonta siliqua Kuster, 1852
Pseudanodonta rayi Bourguignat, 1881
Pseudanodonta ligurica Bourguignat, 1881
Anodonta dorsuosa Drouet, 1881
Pseudanodonta locardi Locard, 1882
Pseudanodonta ararisana Locard, 1882
Pseudanodonta servaini Bocard, 1885
Anodonta pachyproktus Borcherding, 1889
Anodonta fusiformis Borcherding, 1889
Anodonta microptera Borcherding, 1889
Pseudanodonta rothomagensis Locard, 1890
Pseudanodonta nantelica Bourguignat, 1890
Pseudanodonta pechaudi Bourguignat, 1890
Pseudanodonta imperialis Servain, 1890
Pseudanodonta arnouldi Pacôme, 1890
Pseudanodonta isarana Bourguignat, 1890
Pseudanodonta mongazonae Bourguignat, 1890
Pseudanodonta lacustris Servain, 1890
Pseudanodonta rivalis Bourguignat, 1890
Pseudanodonta septentrionalis Locard, 1890
Pseudanodonta aploa Bourguignat, 1890
Pseudanodonta euthymei Pacôme, 1890
Pseudanodonta morini Locard, 1890
Pseudanodonta cazioti Bourguignat, 1890
Pseudanodonta pacomei Bourguignat, 1890
Pseudanodonta trivurtina Bourguignat, 1890
Pseudanodonta brebissoni Locard, 1890
Anodonta albica Drouet, 1893
Anodonta (Pseudanodonta) acutalis Drouet in Westerlund, 1894
Pseudanodonta dumasi Locard, 1894
Pseudanodonta beryacensis Dumas, 1894
Pseudanodonta limosina Dumas, 1895
Pseudanodonta occidentalis Coutagne, 1895
Pseudanodonta nicarica Haas, 1908

Atlantic western Europe to and comprising the Weser in the East; England; France approximately to the Garonne in the south.

Pseudanodonta complanata Rossmaessler, 1835

Anodonta klettii Rossmaessler, 1835
Pseudanodonta nordenskioldii Bourguignat, 1881
Pseudanodonta complanata silesiaca Kobelt, 1911
Pseudanodonta maelarensis Kobelt, 1911

Pseudanodonta borealis Kobelt, 1890, from Newa River, Russia, which occasionally is cited as belonging here, is based upon a misunderstood long and slender form of *Anodonta cygnea* Linnaeus.

Sweden; Atlantic Central Europe from the Elbe in the west to Finland in the east.

Pseudanodonta middendorffi Siemaschko, 1848

Pseudanodonta middendorffi middendorffi Siemaschko, 1848

Anodonta complanata jijiana Nicodim, 1909
Pseudanodonta euxina Rossmaessler in Kobelt, 1911
Anodonta complanata sobriewskii Rosen, 1925

Tributaries of the Black Sea, east of the Danube.

Pseudanodonta middendorffi compacta Zelebor, 1851

Alasmodonta penchinati Bourguignat, 1870
Alasmodonta berlandi Bourguignat, 1870
Pseudanodonta praeclara Bourguignat, 1881
Pseudanodonta letourneuxi Bourguignat, 1881
Pseudanodonta danubialis Bourguignat, 1881
Pseudanodonta mecyna Bourguignat, 1881
Pseudanodonta pančiči Bourguignat, 1881
Pseudanodonta scrupea Bourguignat, 1881
Pseudanodonta rossmaessleri Bourguignat, 1881
Pseudanodonta ellipsiformis Bourguignat, 1881
Pseudanodonta savensis Kobelt, 1911
Pseudanodonta compacta kusteri Haas, 1913

Pseudanodonta compacta küsteri apparently hybridizes with the Atlantic *P. elongata* where their ranges overlap in the Regnitz basin, tributary to the Rhine via the Main (Haas and Schwarz, 1913).

Basin of the Danube.

Genus **Gabillotia** Servain, 1890

This genus is endemic in the palearctic region and is most closely related to *Anodonta*.

Gabillotia pseudodopsis Locard, 1883

Gabillotia locardi Servain, 1890

Known only from Lake Antioch in Syria.

APPENDIX

Unionids which have erroneously been attributed to the palearctic region:

Unio bagdadensis Bourguignat, 1852.—Said to come from Baghdad, but is a synonym of *Caelatura egyptiaca* Caillaud from the Nile.

Unio eucyphus Bourguignat, 1857.—Believed to have been found in the Skamander River, northern Asia Minor, but equally identical with *Caelatura egyptiaca* Caillaud from the Nile.

Unio bythinicus Kobelt, 1893.– Not from Asia Minor, as believed by Kobelt, being nothing but *Elongaria orientalis* Lea from Java.

Unio lapidosus Kobelt, 1893. Supposed to be from the Euphrates River; it is *Lampsilis* (*Disconaias*) *discus* Lea from North Mexico.

Unio wolwichi Morelet, 1845.—This species, which was said to have been found at the banks of the River Tajo in Portugal, has been proved to be a synonym of *Diplodon parallelipipedon* Lea from the Río de la Plata.

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NOTES ON TEXAN SNAKES OF THE GENUS SALVADORA

By Karl P. Schmidt
Curator of Amphibians and Reptiles

In drawing up a list of the amphibians and reptiles of the Big Bend region in Trans-Pecos Texas, based on collections made by Tarleton F. Smith for the National Park Service and by a party from Field Museum and the Chicago Academy of Sciences in 1937, I encounter some difficulty with snakes of the genus *Salvadora.* For the study of the problem opened up by the west Texan collections, it has been necessary to borrow additional material. Our thanks are due to authorities of the Museum of Comparative Zoology, the United States National Museum, the Museum of Zoology of the University of Michigan, and the Chicago Academy of Sciences for loans of specimens.

The problem at issue, the identification of the three forms which I discern in Texan collections, has been discussed with C. M. Bogert, who has reviewed the genus *Salvadora* for the United States, and with Hobart M. Smith, who has reviewed the Mexican forms. The divergence of the views in the present paper from those of Dr. Bogert apparently rests on the study of our new material from Trans-Pecos Texas. Without undertaking a revision of the genus, it is desired to formulate this divergence of opinion and bring the new arrangement proposed to the attention of our herpetological colleagues, especially as Dr. Smith may be expected to reopen the whole problem on the basis of his Mexican collections, made as Walter Rathbone Baker Scholar for the Smithsonian Institution. Dr. Smith (in litt.) agrees with me in rejecting Bogert's treatment of the Texan forms.

Stejneger stated the problem as to the allocation of the names *hexalepis* Cope and *grahamiae* Baird and Girard in his paper on the reptiles of the Huachuca Mountains (1902). Although the type locality of *Salvadora grahamiae* is stated as "Sonora," and hence probably southern Arizona (from Bogert's analysis of Graham's route, in litt.), Stejneger assigns the name also to the southeast Texan form which is abundant at Brownsville. Specimens obtained by Tarleton

Smith and myself in the Chisos Mountains, from the higher forested areas, are in excellent agreement with specimens from the Huachucas and with the type of *grahamiae*. They prove to be readily distinguishable from the Brownsville form. A second species in west Texas from the desert plateaus surrounding the isolated mountain forests proves to be distinguishable from both the Chisos form and that of southeastern Texas; and, though it is directly allied to the Arizonan *hexalepis*, it clearly represents an undescribed form. The name *bairdii* Jan and Sordelli (1860, pl. 3, fig. 2) appears to refer to a form closely allied to the one in southeastern Texas described below as *Salvadora lineata*. I follow the advice of Dr. Smith in reserving the name *bairdii*, at least until the type can be re-examined, for the Mexican form defined in his recent paper (1939, p. 232).

Salvadora grahamiae Baird and Girard.

Salvadora grahamiae Baird and Girard, Cat. N. Amer. Rept., pt. 1, p. 104, 1853

Diagnosis.—A *Salvadora* with edges of rostral only slightly raised; posterior chin shields in contact or narrowly separated; eight upper labials (occasionally nine); ventrals fewer than in *deserticola* and *hexalepis*, and caudals more numerous; caudals more numerous than in *lineata*, from which it is further distinguished by the usual absence of the lateral narrow line and by the broader dorsal light band; no supra-anal keels in adult males.

Remarks.—In the Big Bend region of western Texas this species is represented by a form which appears to be confined to the more humid and timbered upper slopes of the mountains. Our few specimens are insufficient for a detailed comparison with the typical *grahamiae* of the Huachuca Mountains. It seems clear that the Chisos Mountain form is directly allied to that of southern Arizona; and it is believed that *grahamiae* is essentially a relict species with more or less completely isolated populations in the mountains of the Southwest. It is evident that the study of the distribution and variation of these populations represents a most interesting herpetological problem, but one that can scarcely be dealt with until more extensive collections are available.

I am indebted to Dr. Smith for the following manuscript notes on the type of *grahamiae*, U. S. National Museum No. 2081:

"A male specimen. Ventrals 180, anal divided, caudals 97, scale rows 17–17–13; supralabials 9–9, infralabials 9–10; first supralabial separated from posterior section of nasal; second supralabial in contact with loreal on one side; preoculars 3–3; postoculars 2–2; loreal

1-1; temporals 2+3, 2+2, posterior pair of chin shields slightly shorter than anterior, separated medially by two scales along the midgular line. Rostral well developed, with distinct, free lateral edges. Median light stripe three scales wide on anterior two-thirds of body, one and two half scale rows wide on posterior third. Adjacent dark band three scale rows wide on anterior two-thirds of body, one and two half scale rows wide on posterior third. Each scale in these dark bands has the base jet black; the antero-lateral edge of the scales of the two upper rows in the dark bands is white. These white spots are confined to the scales of the median row of the dark

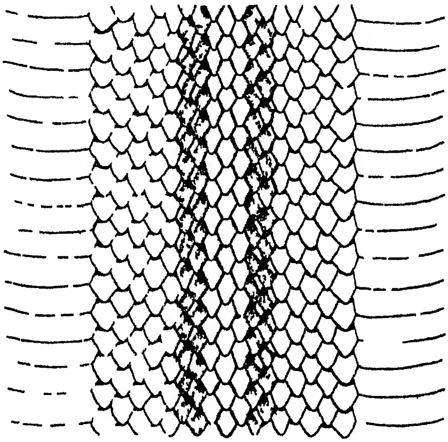

FIG. 13. Pattern of *Salvadora grahamiae* Baird and Girard. Field Museum No. 27720, The Basin, Chisos Mountains, Brewster County, Texas.

stripe on the posterior fourth of the body. No other dark stripes. Total length 690 mm., tail length 184 mm."

The four Huachucan specimens I have examined agree excellently with the type, except for the fact that the upper labials are 8-8 in three and 8-9 in only one. All have dorsal scales 19-17-13, but the drop to 17 takes place at about the twelfth ventral, so that the anterior count is likely to be stated as 17. The ventrals in three males are 180, 181, and 185; 186 in the single female. The corresponding caudals are 107, 107, 97, and 92. Only one specimen agrees with the type in number of preoculars, and this has two on one side and three on the other. A narrow lateral dark line is faint on the third scale row in Field Museum No. 2704, from "Tombstone," collected by F. C. Willard, and hence only presumptively

from the Huachucas. The three remaining specimens agree exactly in coloration with the type (see Baird, 1859, pl. 5, fig. 2).

Four specimens from the Chisos Mountains (two from the Museum of Zoology of the University of Michigan, one in Field Museum and one in the United States National Museum [National Park Service No. 138]) agree in having eight upper labials on each side, no trace of a lateral line, and caudal count high, 101 to 112 (in both sexes). The National Museum specimen, a female, has 197 ventrals, while Field Museum No. 27720, also a female, from the Basin (in the Chisos Mountains), has ventrals 190 and caudals 112; these two specimens agree further in having three preoculars on each side. Differences from the Huachuca series are slight. In the two males and two females available, the ventrals are 179 and 186 in males, 190 and 197 in females; but the caudals are more numerous in females. Should the Chisos and Huachuca populations prove distinguishable as larger series become available, they would still be much more closely allied *inter se* than with any other species of *Salvadora.*

A single male specimen from the Davis Mountains, Field Museum No. 29497, collected by John M. Schmidt in 1938, has ventrals 183, caudals 83, preoculars 3–3, upper labials 9–9, lower labials 11–11, and a faint lateral line on the third scale row. It thus fits neither *hexalepis hexalepis, h. deserticola, grahamiae,* nor *lineata.* It is best left unidentified until a Davis Mountain series is available. It probably belongs with the mountain *grahamiae* series, as is suggested further by the Tombstone specimen mentioned above and by one in the Chicago Academy of Sciences from Silver City, New Mexico (No. 5247), which agrees with *grahamiae* in ventrals and caudals, but also exhibits a lateral line on the third scale row.

Salvadora hexalepis deserticola subsp. nov.

Type from Government Spring, near Chisos Mountains, Brewster County, Texas. No. 26615 Field Museum of Natural History. Adult male. Collected 1935, by Tom Carney.

Diagnosis.—Allied to *Salvadora hexalepis hexalepis* in the separation of the posterior chin shields, enlargement of the rostral, nine upper labials, in having keeled supra-anal scales, and in pale grayish coloration; distinguished by the uniformly single loreal, lower ventral count, and the situation of the narrow lateral line on the fourth scale row instead of on the third and fourth.

Description of type.—Head a little wider than neck, notably truncate anteriorly on account of the enlarged rostral with its raised edges; body slender, tail alternate.

Portion of rostral seen from above equal to its distance from the frontal; internasals subtriangular, prefrontals nearly rectangular; frontal nearly as long as the parietals, which are truncate posteriorly; upper labials 9 10; lower labials 11 11; anterior chin shields longer than posterior; posterior chin shields separated by two scales; nasal divided; loreal single; oculars 2 2; temporals 2 3; ventrals 190, anal divided, caudals 78; dorsal scales 17-17 13, smooth; faint keels present on the supra-anal region.

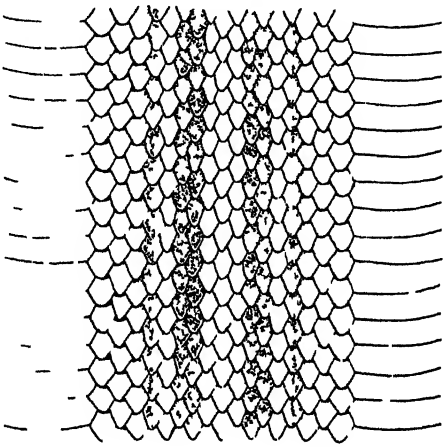

FIG 14 Pattern of *Salvadora hexalepis deserticola* subsp. nov. Field Museum No. 26615, type.

Light ground color gray, involving the three median scale rows, and parts of the adjacent rows, the three lateral scale rows and the upper half of the fourth and all of the fifth on each side; a dark dorsolateral band on each side on the sixth and seventh scale rows, with a narrow lateral line on the lower half of the fourth scale row; dorsolateral band extending forward to the postoculars; lateral line merged with the dorsolateral band on the neck, on the third scale row on the posterior third of the body.

Measurements of type.—Length 854, tail 189.

Notes on paratypes.—Other specimens in Field Museum collections that are referred to *deserticola* are No. 26620, male, Mesa de Anguilla, Chisos Mountains, collected in 1937 by A. E. Borell; and two females, Nos. 25210 and 27719, collected near the Chisos Mountains by Tarleton F. Smith. Blanchard Collection No. 284 from Hayes Ridge, Chisos Mountains (collected by F. N. Blanchard and Howard K. Gloyd), and University of Michigan No. 66023 from

Glenn Spring, also in the vicinity of the Chisos Mountains, are also females. Ventrals and caudals in the male paratype number 195 and 82; in the female specimens they range from 187 to 190 and from 71 to 79. The loreal is invariably single, the preoculars invariably two; upper labials 9-9 in all but one, which has 10-9; lower labials 10-10 in three, 11-10 in one, 11-11 in one, and 12-12 in one; the postoculars occasionally three; the temporals variable, one to three in the first row and two or three in the second; the posterior chin shields are invariably widely separated. All agree in having the dark lateral line confined to the fourth scale row on the anterior two-thirds of the body.

Remarks.—The subspecies *deserticola* may be associated with the west Texan creosote bush desert. Its relation to the Chisos population of *grahamiae* is evidently the same as that of *hexalepis hexalepis* to the Huachucan *grahamiae.* It may be pointed out that the range of *h. hexalepis* as thus restricted includes two very different vegetational regions, the Sonoran desert of western Arizona to southwestern Utah and Lower California, and the grassy region of southeastern Arizona. *Salvadora hexalepis virgultea* occupies a more uniform faunal area.

Salvadora lineata sp. nov.

Type from Kingsville, Kleberg County, Texas. No. 28605 Field Museum of Natural History. Adult female. Collected 1938, by Professor J. C. Cross.

Diagnosis.—A *Salvadora* with rostral edges little raised, posterior chin shields in contact or narrowly separated, upper labials almost invariably 8–8, lower labials more frequently 9 than 10, ventrals few, 179 to 192 in males, 189 to 194 in females, caudals 90 to 103 in males, 91 to 93 in females. Supra-anal scales not keeled. In most of these characters *lineata* agrees with *grahamiae;* it is sharply distinguished from that form by having a well-defined lateral line, which is on the third scale row anteriorly (the second posteriorly). The anterior section of the nasal is usually in contact with the second labial, and the dorsolateral dark stripe passes over the temporal region to the eye.

Description of type.—Head a little wider than body, body slender, tail attenuate. Snout rounded, edges of rostral slightly raised (worn in type specimen).

Portion of rostral seen from above about equal to the internasal suture, which is nearly as long as the preocular suture; frontal longer than its distance from the end of the snout, about as long as the

parietals, which are truncate posteriorly; upper labials 8-8; lower labials 10 10; nasal divided; loreal single; oculars 2-2; temporals 2 2 and 2-3; ventrals 201, anal divided, caudals 93; dorsal scale rows 19 17-13, smooth.

Dorsal stripe pale yellowish, less than three scale rows wide except on the neck; adjacent dorsolateral dark brown band on the fifth, sixth, seventh, and part of the eighth scale rows, very sharply defined, with light bluish spots on the lower anterior borders of the dark scales; dark band continued forward to the loreal region; sides greenish gray; a narrow dark line on the middle of the third scale row, beginning on the neck about the length of the head behind the

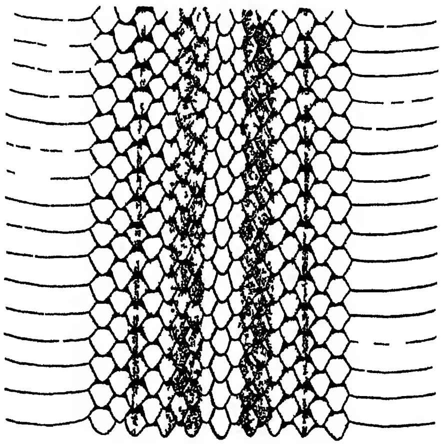

FIG. 15. Pattern of *Salvadora lineata* sp. nov. Field Museum No. 6903, Point Isabel, near Brownsville, Texas.

rictus, continued to the anus; the lateral line is on the third scale row on the posterior third of the body; top of head brown.

Measurements of type. Length 753, tail 192.

Notes on paratypes. Twelve male and seven female specimens may be regarded as paratypic. Of these Field Museum Nos. 3395, 3395a c, 5493, 6795 98, Chicago Academy of Sciences No. 5239, and Museum of Comparative Zoology No. 13823 are from Brownsville, Texas; Field Museum No. 6903 is from Point Isabel, near Brownsville; Field Museum No. 25742 is a specimen received through the Lincoln Park Zoo, hence probably from W. A. King, of Brownsville; U. S. National Museum No. 26441 is from Kinney County; Chicago Academy of Sciences No. 5240 is from San Antonio, Bexar County, as is No. 67363 of the National Museum collection; No.

55798, also in the National Museum, is from Waco, McLennan County; and Museum of Comparative Zoology No. 43910 is from Georgetown, Williamson County. A specimen from Ernest G. Marsh (field No. 85) is from Musquiz, Coahuila. This series is remarkably uniform in coloration, and the narrow lateral line is sharply defined on the third scale row in all. The ventrals in twelve males range from 179½ to 192 (average 187), and in eight females (including the type) from 187 to 201 (average 193). The caudals range from 90 to 103 in nine males (average 93), and from 85 to 93 in six females (average 90). The dorsal scale formula is 19–17–15 in six of the female paratypes, while in nine out of twelve males the posterior count is 13; upper labials 8–8 in all but one specimen, lower labials 9–9 in twelve, 10–10 in eight; preoculars 2–2 in thirteen, 1-2 in one, 2–3 in two, 3-3 in four, and 4–3 in one; postoculars 2–3 in one, 3–3 in two, 2-2 in seventeen; temporals variable, 2-2-3 to 3–4–4. The supra-anals are *not* keeled in adult males.

Remarks.—*Salvadora lineata* appears to be abundant in the lower Rio Grande Valley, whence we have fourteen specimens. Musquiz, in the basin of the Rio Alamos, is obviously a normal extension from the Rio Grande Valley. It is clearly this form which is recorded from southeastern Texas by Strecker (1915, p. 36) from Kerr, Kendall, Comal, McLennan, and Matagorda counties.

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A NEW TOAD FROM WESTERN CHINA

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In identifying specimens of amphibians and reptiles from western China obtained for Field Museum by the late Floyd T. Smith, we find a very distinct new toad. We feel that the relations of the new form are best shown by placing it as a subspecies of the widespread common toad of Europe and Asia, *Bufo bufo*, but it is of more than usual interest for the remarkable secondary sex character of loose dorsal skin in the male. This character has been described by the junior author for the allied *Bufo bufo japonicus* of North China (Liu, 1936, p. 126). Our new name, *Bufo bufo wrighti*, appears as a nomen nudum in the paper on the vocal sac in the Salientia, also by the junior author (Liu, 1935, p. 30); our original description was drawn up in 1935.

Recent observations in the field by the junior author serve to distinguish the tadpole of our new form from that of *Bufo bufo gargarizans*, the common toad of the lower Yangtze Valley. The differences are shown in the accompanying figures.

Bufo bufo wrighti,[1] subsp. nov.

Type from Ho Ni Pa, thirty miles southeast of Moupin, Hsikang. No. 16829 Field Museum of Natural History. Adult male. Collected May, 1931, by Floyd T. Smith.

Diagnosis.—A large toad allied to *Bufo bufo*, agreeing with *Bufo bufo gargarizans* in having the top of the head smooth, and with *Bufo bufo japonicus* in having the head and jaw elongate; it differs from both in having longer legs, with toes much more fully webbed. Parotids parallel instead of divergent.

[1] Named for Dr. Albert Hazen Wright, Professor of Vertebrate Zoology at Cornell University, whom we hold in affectionate regard.

Description of type.—Head broader than long, snout pointed, with obtuse canthus rostralis; loreal region nearly vertical; nostrils separated by a distance equal to their distance from the eye; legs long; top of head smooth, flat; eyelids wrinkled but not tuberculate; tympanum small, oblique, just below the parotid gland; parotid glands elongate, wider anteriorly, not kidney-shaped; two very conspicuous post-rictal glands; dorsal surface covered with round,

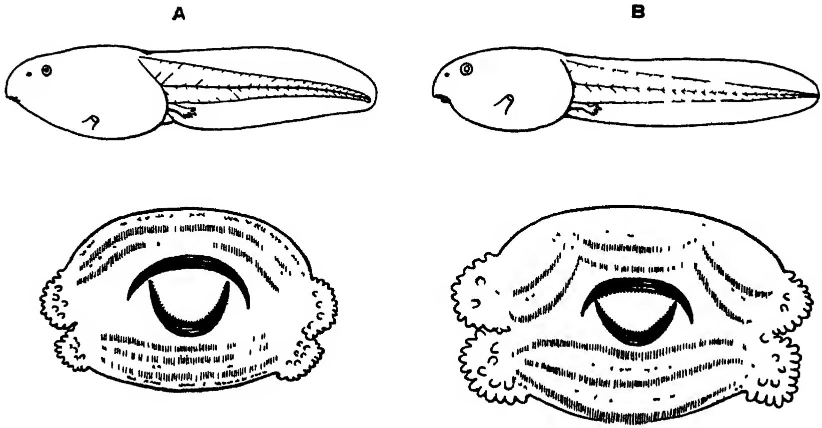

FIG. 16. *A*, Tadpole and tadpole mouth parts of *Bufo bufo gargarizans* Cantor. *B*, Tadpole and tadpole mouth parts of *Bufo bufo wrighti*, sp. nov.

smooth warts, relatively few in number; large irregular glands on the tibia; a large single gland on the upper surface of the tarsus; fingers free, slightly fringed, first and second equal; toes webbed to the tips except the fourth, which has the three terminal phalanges free but broadly fringed; inner metatarsal tubercle oval, outer round; no tarsal fold; skin of upper surface of body and thighs very loose; forearms much enlarged; belly pale, with indistinct black spots, back dark, without markings.

Measurements.—Type: body length 74; width of head at angle of mouth 29; hind limb 120; tibia 34. Allotype (Field Museum No. 16813): body 95; width of head 36.5; hind limb 128; tibia 37.

Notes on paratypes.—The paratypes available are three males, Field Museum Nos. 16827–8 and 16830, and one female, No. 16813, from Ho Ni Pa, and in addition a series of ten males and nineteen females from Tailing, sixty miles or more to the northwest of the type locality, Nos. 15209 and 15238. Female specimens have a firm dorsal skin, with smaller warts, and no distinct tarsal

gland. The ratio of the length of the leg to that of the body ranges from 1.40 to 1.62, averaging 1.48, in the males, and from 1.28 to 1.56, averaging 1.33, in the female specimens. This character accordingly overlaps the measurements of *Bufo bankorensis,* and without the clearly different shape of head and the curious loose skin characteristic of the males, we would hesitate to distinguish the present form. With these supporting characters, however, even the difference in leg length seems significant.

Tadpole.—Tail darker and its fin longer and relatively narrower than in *Bufo bufo gargarizans.* Mouth parts characterized by two complete and sharply angulate upper labial tooth rows. The lower of the two upper rows in *gargarizans* is interrupted. The tadpole of *Bufo bufo wrighti* figured comes from Moupin, Hsikang, and is in the collection of the junior author.

Remarks.—This form appears to be more closely allied to *Bufo bufo japonicus* of North China than to *Bufo bufo gargarizans,* whose range it adjoins. The senior author's unfortunate misidentification of the toads of the lower Yangtze Valley as *Bufo bankorensis* (Schmidt, 1926, p. 75, and 1927, p. 557) is partly cleared up by Pope (1931, p. 456); we differ from his list in that we distinguish the toads of North China from those of the central Chinese lowlands, and employ the earlier name *gargarizans* Cantor for *asiaticus* Steindachner.

Our arrangement of the subspecies of *Bufo bufo* in China is as follows:

A. Top of head tuberculate in adult, leg-length in males 1.31 of body length, skin of breeding males loose (North China, Manchuria, Korea, and Japan). *Bufo bufo japonicus.*

AA. Top of head smooth.

- B. Legs very long, ratio to body length in males 1.48, head long, parotoids parallel, toes extensively webbed, skin of breeding males loose (Hsikang). *Bufo bufo wrighti.*
- BB. Legs and head shorter, webs much less developed, skin of breeding males firm.
  - C. Head large and broad; ratio of leg length to body length in males 1.44 (mountains of Formosa and Fukien)........*Bufo bufo bankorensis.*
  - CC. Head short and narrow, parotoids diverging, ratio of leg length to body length in males 1.39 (Yangtze Valley from Chusan Island to Szechwan)........................*Bufo bufo gargarizans.*

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ZOOLOGICAL SERIES

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A NEW VENEZUELAN HONEY CREEPER

BY EMMET R. BLAKE

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Among birds collected by the Mandel Venezuelan Expedition of Field Museum on the upper slopes of Mount Turumiquire are five specimens representing an undescribed race of *Diglossa baritula*. The range of the species is thus extended eastward approximately 250 miles from the north coast mountains of Venezuela in the vicinity of Caracas, eastern limit of *D. b. hyperythra*, the closest geographical representative.

For the loan of comparative material I am indebted to Mr. James L. Peters, of the Museum of Comparative Zoology, Mr. John T. Zimmer, of the American Museum of Natural History, Mr. James Bond, of the Philadelphia Academy of Sciences, Dr. Herbert Friedmann, of the United States National Museum, and Mr. W. E. Clyde Todd, of the Carnegie Museum.

Diglossa baritula mandeli[1] subsp. nov.

Type from Mount Turumiquire, Sucre, Venezuela. Alt. 6,000 feet. No. 92646 Field Museum of Natural History. Adult male. Collected February 19, 1932, by Emmet R. Blake. Orig. No. 85.

Diagnosis. Resembles *Diglossa baritula d'orbignyi* Boissonneau in size and color pattern, but under parts much deeper ochraceous; crown and sides of head darker, the former being distinct from the upper back. Nape, back, and upper tail coverts darker than in *d'orbignyi*, but more clearly blue, with less gray-blue intermixture. Under carpal coverts Slate-Gray.[2]

Description of type.—Crown Bluish-Black, becoming darker on forehead and auriculars; lores black; nape, back, and upper tail

[1] Named for Mr. Leon Mandel, of Chicago.

[2] Capitalized names of colors are from Ridgway's *Color Standards and Nomenclature*, 1912.

coverts Slate-Gray; wing coverts, tectrices, and rectrices black, edged externally with Slate-Gray; entire under parts, including flanks and under wing coverts Tawny-Olive; under tail coverts slightly darker; under carpal coverts Slate-Gray; tibia dull Slate-Gray. Wing, 57; tail, 46; culmen, 10.

Range.—Known only from the subtropical forests of the type locality, on the basis of four males and one female (subadult).

Remarks.—The female is known from a single specimen (subadult) which differs from the female of *D. b. d'orbignyi* in being yellower.

Discovery of a distinct new species, *Diglossa venezuelensis,* in the Subtropical zone of Mount Turumiquire by Mr. G. H. H. Tate, of the American Museum of Natural History, in 1925 extended the known range of the genus eastward from the Silla de Caracas by approximately 250 miles. The more recent discovery of a geographical representative of *Diglossa baritula* in northeastern Venezuela not only extends similarly the range of that widespread species, but also strengthens the close faunal relationship between the two subtropical regions that has been noted by Dr. Chapman (Amer. Mus. Nov., **191**, pp. 1–15, 1925). Geographically, *mandeli* is nearest *hyperythra* of north-central Venezuela but in physical appearance it quite unexpectedly shows closer affinity with *d'orbignyi* of the more distant Méridan Andes.

The following specimens have been examined:

Diglossa b. baritula.—9: MEXICO (Contreras, Mexico, 1; Desierto de Leones, Mexico, 1; Mirador, Vera Cruz, 5; San Bartolo, San Luis Potosi, 1; Valley of Mexico, Distrito Federal, 1).

Diglossa b. montana.—9: GUATEMALA (Sierra Santa Elena, Chimaltenango, 2;[1] Tecpan, Chimaltenango, 1; Volcan Tajumulco, San Marcos, 3). EL SALVADOR (Los Esesmiles, Chalatenango, 3).

Diglossa b. parva.—9: HONDURAS (Alto Cantoral, Tegucigalpa, 4; Tegucigalpa, Tegucigalpa, 5).

Diglossa b. plumbea.—30: COSTA RICA (Coliblanco, Cartago, 16; Volcan Irazu, Cartago, 3; Volcan Turrialba, Cartago, 11).

Diglossa b. veraguensis.—5: PANAMA (Chitra, Veragua, 5).[1]

[1] Including the type.

Diglossa b. hyperythra.—13: COLOMBIA (El Mamón, Magdalena, 2; Pueblo Viejo, Magdalena, 2; San Antonio, Magdalena, 1; San Sebastian, Magdalena, 1; Santa Cruz, Magdalena, 1). VENEZUELA (Colonia Tovar, Aragua, 5; Pico Naiguaté, Miranda, 1).

Diglossa b. d'orbignyi.—52: COLOMBIA (Cerro Munchique, Cauca, 1; El Roble, Cundinamarca, 1; La Candela, Huila, 1; La Honda, Cundinamarca, 1; San Agustin, Huila, 2; San Antonio, Cauca, 5; Quetame, Meta, 2; Rio Toche, Tolima, 1; also 7 "Bogota" trade skins). VENEZUELA (Culata, Mérida, 7; Escorial, Mérida, 1; Mérida, Mérida, 10; Valle, Mérida, 13).

Diglossa b. mandeli.—5: VENEZUELA (Mount Turumiquire, Sucre, 5).[1]

Diglossa b. decorata.—7: PERU (Cajamarca, Cajamarca, 2;[1] Chinchao, Huánuco, 4; Huachipa, Huánuco, 1).

Diglossa b. sittoides.—2: BOLIVIA (Tiraqui, Cochabamba, 2).

[1] Including the type.

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A NEW SAVANNAH SPARROW FROM MEXICO

BY SIDNEY CAMRAS

While examining the Savannah sparrows in Field Museum with reference to the recent revision by Peters and Griscom, I found four summer specimens from west-central Chihuahua, where the species was not known to breed. The birds were unlike any of the North American forms, and agreed most closely with descriptions of *brunnescens*, the race of south-central Mexico. Shortly afterwards, Mr. A. J. van Rossem visited the Museum and, upon examining the specimens, suggested that comparison with *brunnescens* might show that they represented a new subspecies. This comparison has been made, through the courtesy of the authorities of the United States Biological Survey and Field Museum, who arranged a loan of the Survey's series of *brunnescens*. The Chihuahua birds prove to be different and may be called

Passerculus sandwichensis rufofuscus subsp. nov.

Type from Babicora, Chihuahua, Mexico. No. 13076 Field Museum of Natural History. Adult female. Collected June 15, 1902, by G. F. Breninger.

Diagnosis.—Nearest to *Passerculus sandwichensis brunnescens* Butler, but with the brownish tones brighter throughout and the black markings heavier. Distinguishable from all the members of the genus by its bright coloration.

Range.—Known only from the type locality.

Measurements.—Two males: wing (chord) 70.0, 71.2; tail 49.7, 50.0; tarsus 20.5, 20.5; exposed culmen 11.1, 10.7; depth of bill 5.9, 6.0. Two females (type in parentheses): wing (chord) (64.5), 65.0; tail (45.5), 43.8; tarsus (20.4), 20.0; exposed culmen (11.1), 10.0; depth of bill (5.8), 5.9.

Remarks.—Exactly how the new race differs from the recently described *wetmorei* van Rossem, of Guatemala, can only be deter-

mined by direct comparison, but from the dorsal similarity of *wetmorei* and *alaudinus* Bonaparte (i.e. *bryanti* Ridgway) the present form must be lighter and brighter in coloration.

The long tail ascribed to *brunnescens* by Oberholser (Sci. Pub. Cleveland Mus. Nat. Hist., **1**, p. 110) on the basis of the measurements published by Ridgway is not supported by my measurements, which are as follows:

	Males	Wing	Tail
brunnescens	15	70.69	48.31
nevadensis	17	69.45	48.43
anthinus	14	71.82	50.46

The discovery of a bird geographically between *brunnescens* and *nevadensis* and yet showing no signs of intergradation is rather unexpected. Where the new bird meets *nevadensis*, from which it is so distinct, if it does so at all, would be very interesting.

Through the courtesy of Professor C. W. G. Eifrig, two specimens of *brunnescens* in fresh breeding plumage, lent to him by the Carnegie Museum, have been examined. Miss Ruth Trimble has kindly furnished the data of several other Mexican Savannah sparrows in the Carnegie Museum. Dr. H. C. Oberholser and Mr. R. T. Moore also have sent information for which I am grateful.

Thanks are particularly due to Mr. van Rossem, who examined the material upon which this paper is based, and supplied much information on types and relations of members of this group.

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REPTILES AND AMPHIBIANS FROM CENTRAL ARABIA

BY KARL P. SCHMIDT
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A small series of reptiles and amphibians collected during recent journeys in central Arabia and presented to Field Museum by Mr. H. St. J. B. Philby forms a welcome addition to Field Museum's collections from southwestern Asia. That the fauna of this region is still far from completely known is again brought to our attention by the presence of an extremely distinct new skink of the genus *Scincus* in Mr. Philby's collection. The fact that the list of reptiles collected by Mr. Philby on his expedition through the Rub' al Khali in 1932 (Parker, 1933) is entirely different from the present one, though unquestionably in part fortuitous, is further testimony to the geographic diversity of the Arabian fauna.

The map showing localities from which specimens are here reported is the work of Mr. Peter Gerhard, a volunteer cartographer in the Department of Anthropology. This has been drawn under the direction of Dr. Henry Field, whose continued interest in southwestern Asia has contributed so much to the growth of our collections from that area. These collections have recently been listed in our Zoological Series (Schmidt, 1939). The figure of the head of the new lizard is by John J. Janecek.

Bufo viridis viridis Laurenti.

Three specimens from Hāil (31655) and three from Hulaifa (31655a).

Ptyodactylus hasselquistii hasselquistii Donndorff.

Eight specimens from Riyādh (31653).

Agama pallida Reuss.

Two specimens from the plain of Sa'ira, one from Butain Plain, and one from Wādi ar Rima (31660–63).

Agama persica Blanford.

Two from Wādi ar Rima (31658–59).

The curious fact that this species has not been reported from Iran since its original description, though supposedly abundant and widespread in the Mesopotamian region, while *Agama agilis*, whose type locality is Baghdad, is known only from Iran, suggests some unexplained confusion of species.

Agama stellio stellio Linnaeus.

One specimen from Jabal Ajā, in a rocky ravine (31656).

Uromastix aegyptius Forskål.

One from Wādi Sirra (31641), one from Midbar ridges on the Medīna-Hāil road (31642), two from plain of Sa'ira (31643–44), one from Butain Plain (31030), and one from the desert near 'Anaiza (31032).

Varanus griseus Daudin.

A single specimen from Jidda (31645).

Acanthodactylus fraseri Boulenger.

Acanthodactylus fraseri Boulenger, Journ. Bombay Nat. Hist. Soc., 25, p. 373, 1918—Zobeya, Shariba, Lower Mesopotamia (now Iraq).

A single juvenile specimen from 'Anaiza (31652).

Scincus philbyi sp. nov.

Type from 'Anaiza, Saudi Arabia. No. 31664 Field Museum of Natural History. Adult female. Collected June 11, 1938, by H. St. J. B. Philby.

Diagnosis.—A species of *Scincus* with the ear opening extremely obscure; 28 scales around the body; six supraoculars; rostral in contact with the internasal; prefrontals fused to form a single transverse shield; female with bold, dark brown spots on sides. Distinguished from *Scincus scincus* by its united prefrontals, more obscure ear-opening, and by the dark lateral spots in the female.

Description of type.—Body of the normal *Scincus* type; ear opening extremely obscure, marked by a slightly modified scale, separated from the rictus by two scales; snout produced, elongate; rostral much enlarged with a sharp horizontal edge, broadly in contact with the large internasal; internasal broadly in contact with the single transverse prefrontal; frontal elongate, narrowed behind;

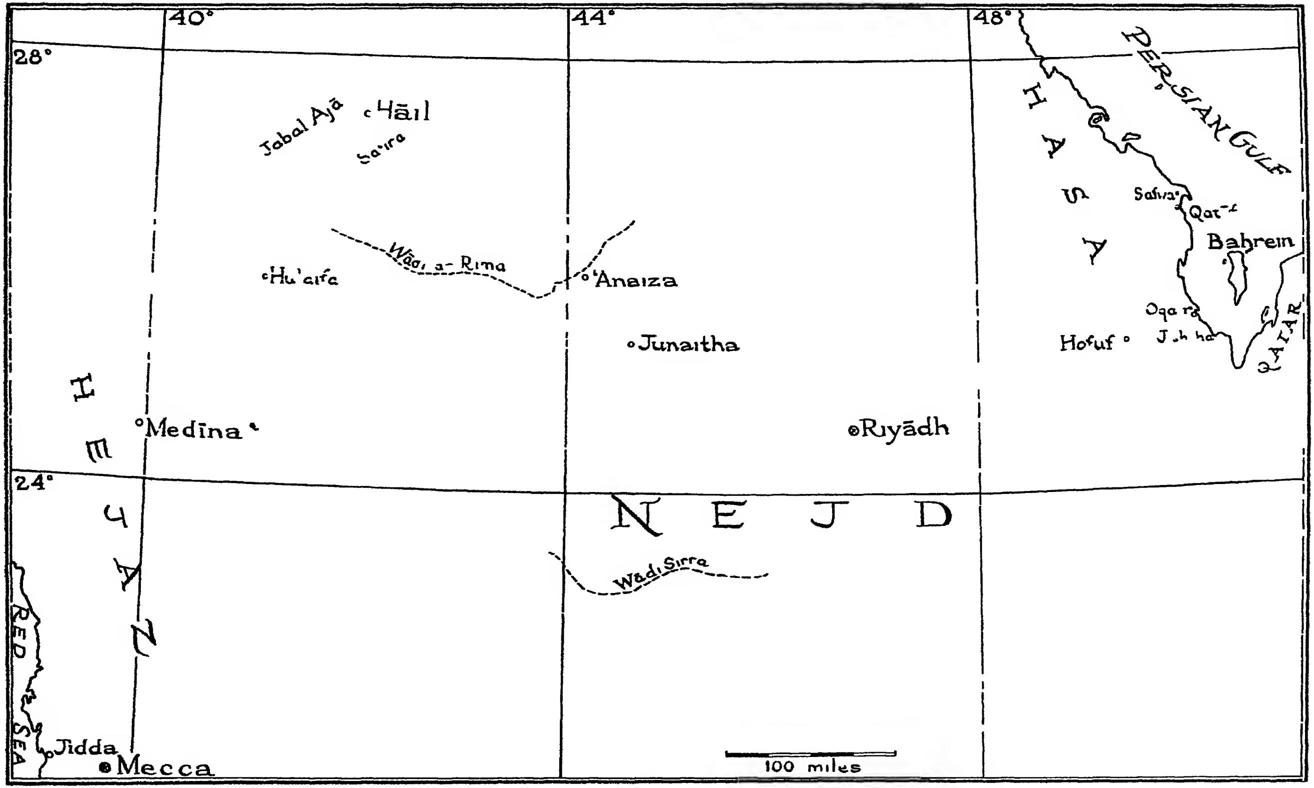

FIG. 17. Localities from which specimens are listed.

six supraoculars; four superciliaries, the first much the longest, frontoparietals small; interparietal small, separating the two pairs of parietals, which are followed by four nuchals on each side; nasal, with the elongate nostril, smaller than supranasal; two elongate loreals on each side; four suboculars; temporals 2–2 on each side; upper labials 8–8; lower labials 7–7; two median postmentals; 26 scales at mid-body, 28 at a point slightly posterior; dorsals 57 from a point opposite the posterior face of the thighs to the interparietal;

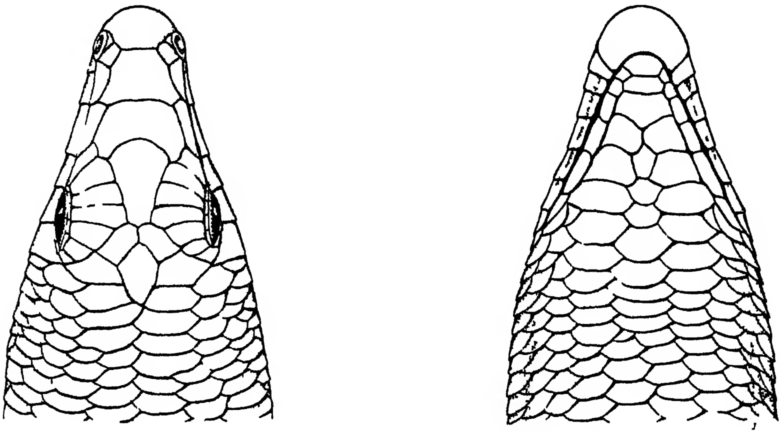

FIG. 18. Head of *Scincus philbyi* sp. nov., dorsal and ventral views.

a pair of large anal plates; 60 ventrals from anals to a point opposite the rictus; 10 lamellae beneath the fourth toe; expansions of the digital lamellae well developed.

Brown above, paler on the sides and venter, with large chocolate brown spots on the sides (four on the left, five on the right); these spots about as high as wide, covering 4 to 6 scales; dorsal scales each with one or two light spots.

Measurements.—Total length 177, tail 77.

Notes on paratypes.—Eleven paratypes, four females and seven males (No. 28599), all collected at the same locality as the type, are in excellent agreement with the type. All have the single prefrontal, and all the females bear the prominent lateral spots (four to six in number), while the males are entirely without them. All have 28 scales around the body; the number of dorsals varies from 56 to 62; the number of ventrals from 60 to 68; the nuchals from 2–3 to 5–5; lamellae beneath the fourth toe 10 or 11; tail length 0.38 to 0.44

of the total length in females, average 0.40, and from 0.37 to 0.45 in males, average 0.42.

Remarks.—*Scincus philbyi* can scarcely be regarded as a geographic form of any species already known. The considerable number of species of *Scincus* appears to be correlated with their restriction to the dune sand habitat, and consequent isolation by intervening rock desert. The west Algerian form described by Werner as *Scincus officinalis laterimaculata* (1914, p. 13, pl., fig. 3) agrees closely with the form here described in color pattern; presumably it has the normal pair of prefrontals of *Scincus scincus*. *Scincus meccensis* has fewer scales around the body and five supraoculars; it agrees with *philbyi* in the presence of brown spots on the sides, but these are two or three in number. *Scincus mitranus* Anderson is recorded from Jafura and the Rub' al Khali by Parker (1933, p. 398); while this species has reddish brown lateral spots like those of *philbyi*, it is described as having five supraoculars and two prefrontals.

Coluber rhodorhachis Jan.

One specimen from Wādi Sirra (31649) and three from Jidda (31646–48). Ventrals in two males and one female from the latter locality are 220, 224, and 224; the female specimen from Wādi Sirra has 235 ventrals. All these specimens represent the immaculate gray phase of this species.

Spalerosophis cliffordii Schlegel.

A single specimen from Hulaifa (31650), and a female from Jidda (31651). Ventrals and caudals respectively 215 and 76, and 215 and 71.

Aspis cerastes Laurenti.

A single female, without horns, from Junaitha (31654), with 153 ventrals and 33 caudals.

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MALACOLOGICAL NOTES—II

BY FRITZ HAAS
CURATOR OF LOWER INVERTEBRATES

A NEW MARINE PROSOBRANCH SNAIL FROM THE YUCATAN COAST

A small gastropod shell from Yucatan in Field Museum's collections since 1895 proves to represent a fine new species of the fasciolarid genus *Latirus*. On corresponding with Dr. Paul Bartsch of the United States National Museum about it, I learn that he has already recognized the same form from three specimens in his charge. One of these, with photographs of the others, has been forwarded for comparison with our specimen. I am greatly indebted to Dr. Bartsch for his courtesy in allowing me to publish a description of the new form.

Latirus festivus sp. nov. (pl. 1; pl. 2, figs. *a*, *b*).

Type from Mujeres Island, Yucatan, Mexico. No. 13754 Field Museum of Natural History. Collected in 1895 by C. F. Millspaugh.

Diagnosis.—A small species of *Latirus*, characterized by heavy and brightly colored spiral sculpture, by complete absence of axial ribs and by a comparatively small and narrow aperture which shows two columellar folds.

Comparisons.—The allied West Indian *Latirus ernesti* Melville differs from *festivus* in its ochraceous ground color with white lirae, and in the greater number and more nearly equal width of the lirae. *Mitra roborea* Reeve, which I suspect to be a *Latirus*, is known only from its description and figure. It differs from *festivus* in being higher (16.5) and more slender (width only 6.5); by different color pattern, namely, white cords on a blackish-brown background; and by the cords being, apparently, narrower than the separating spaces.

Description of type.—Shell elongate, biconical to turreted, strongly and spirally sculptured; aperture comparatively short; a short canal, curved leftward and backward; spire acuminate with broad apex, consisting of about six whorls; suture hardly visible. A broad yellow

spiral cord or lira just beneath the suture, followed by two narrower purplish cords of almost equal width bordered with yellow; on the penultimate and the antepenultimate whorl, a third narrow yellow cord is developed between the broad subsutural one and the two narrower lower ones, and there may even be traces of additional narrow cords on the last two whorls. The last whorl shows one broad yellow subsutural cord, two to three narrower purplish ones, another broad yellow one and, lastly, toward the base of the shell, two narrow purplish cords; the canal is adorned by one broad yellow and two narrow purplish cords, so that, as a whole, there are three broad yellow cords and six to seven purplish ones on the last whorl and its canal. The cords have a polished, enameled surface and are separated by incised narrower lines; these incised lines are black and show a fine but distinct vertical striation (pl. 2, fig. *a*). The apical whorls are worn and thus have a dull appearance; their colors are alternately grayish-blue and grayish-purple. The nepionic part of the apex has entirely disappeared. The columella is lined with an especially heavy coat of purplish brown enamel, which is raised and forms a decided rim at its left side and which vividly contrasts in color with the gaily sculptured outer surface. There are two rather obvious oblique folds on this columellar enameled coat, corresponding in position to the continuation of the two purplish spiral cords of the surface situated between the central and the lower broad yellow cord; but these two columellar folds are separated from the cords mentioned by the raised enamel coat of the columella. At the base of the shell there is a kind of narrow, shallow, umbilical chink, bordered at the left by the external surface and at the right by the rim of the enameled coat of the columella.

Measurements.—The type is an immature specimen, measuring 7 mm. in height, 3 in width, and 2.5 in height of aperture; the paratype measures 10.75 in height, 4.25 in width, and 4 in height of aperture.

Notes on paratypes.—No. 253874 United States National Museum, with photographs of two additional specimens in the same lot, are full-grown, and afford information as to the form of the aperture in the adult. These shells are much worn. The aperture in these specimens (pl. 2, fig. *b*) is pear-shaped, with a small but obvious sinus at the upper end, bordered by a knob-like protuberance at the left side. The short canal is narrow, bent to the left and backward. There is no indication of an external lip; the last whorl seems to bend inward at the aperture, with an ill-defined thickening of the edge. The external

LATIRUS FESTIVUS sp nov
Type, Field Museum No 13754, × 8

ribs do not appear as teeth on the outer margin of the aperture, but the incised spiral lines of the outer surface are so impressed as to form narrow raised ridges on the inner surface, thus appearing as internal teeth when seen from the aperture. The interior surface of the aperture is purplish-brown, with the inner ridges whitish by contrast.

Discussion.—The only species closely allied to the new form is *Latirus ernesti* Melville, from the West Indies (pl. 2, fig. *c*). This shell, not recorded since its original description (Proc. Mal. Soc. Lond., **9**, p. 147, 1 fig., 1910), is certainly related to *festivus* and with it apparently forms a distinct group within *Latirus,* superficially resembling typical *Latirus* (especially *L. craticulatus* Linnaeus and *turritus* Gmelin) but differing in lacking the vertical folds, or rounded ribs, which cross the spiral cords in the typical subgenus. Other features of the shell exclude *festivus* and *ernesti* from the other subgenera of *Latirus.* The distinction of a new subgenus for these forms should, however, await additional material, and especially the study of the anatomy of the soft parts.

Mitra roborea Reeve was described in 1845 (Proc. Zool. Soc. Lond., 1845, p. 57) and figured in 1849 (Reeve, Conch. Icon., **2**, pl. 37, fig. 306) without adequate description or statement of its origin. Most authors have ignored this form, but Tryon (Man. Conch., **4**, p. 140, pl. 41, fig. 201, 1882) lists it as a mitrid of the genus *Cancilla,* though suspecting that it might be a *Latirus.* This supposition is made more likely by the discovery of *festivus.*

In the hope of locating the type of *roborea,* I wrote to Mr. J. R. Le B. Tomlin, of the British Museum, who replied as follows: "A few years ago I went through all the Mitridae in the British Museum, and fortunately kept notes. I do not think that *roborea* is a mitrid at all. Anyhow it was described ex coll. Metcalfe and the British Museum possesses hardly anything of his. I recollect only one set of types there that belonged to Metcalfe—a Turrid. Some years ago I made a considerable effort to find out what had happened to his collection. He seems to have died over ninety years ago. After much writing I unearthed some grandchildren of his and met one of them in London. He said that the collection was sold by his father—probably at Stevens' Auction Rooms—but he could give no details whatever. Anyhow, all trace of the collection has vanished. As there is no specimen in existence, I'm afraid *roborea* must be written off as a lost species." The figure of *Mitra roborea* is here reproduced (pl. 2, fig. *d*).

APICAL SCULPTURE OF THE GENUS IMBRICARIA SCHUMACHER

Neither Schumacher, the author of the mitrid genus *Imbricaria* (Essai Nouv. Syst. Habitations Vers Test., p. 71, 1817), nor Swainson, who bestowed the generic name of *Conoelix* upon the group of species under consideration (Zool. Illus., 1, pl. 24, 1821), nor any of the subsequent authors of malacological textbooks, mentions the rather strongly developed apical sculpture of these shells. In their accounts the apical part of the shell of this genus is described as almost smooth. Kuster was apparently the only one to note this strange apical feature of *Imbricaria*, for he states that the first whorls of *Imbricaria dactyloidea* Anton show longitudinal furrows (Martini-Chemnitz, Ill. Conch. Cab., 5, p. 74, 1839).

In arranging the species of *Imbricaria* in Field Museum I have been struck by the singular sculpture and peculiar shape of the apices of some fresh specimens. Thus *Imbricaria olivaeformis* Swainson has a blunt apex, consisting of about 3½ whorls which are regularly latticed by the crossing of vertical striae with two rows of revolving striae; at the end of the last apical whorl this sculpture becomes gradually weaker, especially in its lower part, and the following whorls show only a kind of crenulation on their upper suture, but are otherwise smooth; the sutural crenulation continues less regularly on the following whorls (pl. 2, fig. *e*).

In *Imbricaria vanikorensis* Quoy the apex is much like that in the preceding species, but the sutural crenulation is stronger on the later whorls and continues even to the body whorl; the apex is nearly cylindrical, passing rather abruptly into the conical part of the spire. The earliest whorls on the specimen studied are too much worn to show any traces of sculpture, but they presumably had the same pattern of cancellation as the adjoining apical whorl (pl. 2, fig. *f*).

ANOTHER AMERICAN RECORD OF BULLARIA STRIATA

In addition to the common North American bubble shell, *Bullaria (Bullaria) occidentalis* Adams, a closely related European species, *B. striata* Bruguière, has occasionally been collected on the American side of the Atlantic Ocean along the shore of Palm Beach County, Florida. A specimen in Field Museum supplies a further record with an indisputable specimen, No. 13056, of *striata* from Charlotte Harbor, De Soto County, Florida.

APICAL SCULPTURE OF NORRISIA NORRISI

The trochid genus *Norrisia* Bayle, with its unique species *norrisi* Sowerby from California, is described by authors who have dealt

with it, as absolutely or almost smooth. I have found no remark whatever as to an apical sculpture. A young specimen of *Norrisia norrisi*, with only 3½ whorls (Field Museum No. 7658), from Monterey, California, proves that there is a rather dense system of incised spiral lines on the first whorls in the unworn young shell (pl. 2, fig. *g*). These lines become less obvious on the fourth whorl, where they are crossed by numerous growth marks; they soon disappear on later whorls. Old and full-grown specimens show scarcely any traces of this original apical sculpture, since the incised grooves no longer show on their somewhat worn apical portions.

ADDITIONS TO THE MOLLUSK FAUNA OF BERMUDA

In identifying mollusks collected by T. H. Bean in the course of the Field Museum Bermuda Expedition, in 1905, I find several species new to the archipelago and one species apparently even new to science. The land shells collected by Bean represent twelve localities and belong to seventeen of the more common species. There are no pupillids, endodontids, nor any of the smaller zonitids in the lot. There is no need of enumerating this part of the material.

Marine mollusks from about twenty localities amount to forty-eight species, most of them widespread and already recorded from Bermuda. *Tenagodus (Agathirsus) squamatus* Blainville seems not to have been recorded since Dall's list. It was taken by Bean at the Argus Bank, at a depth of thirty fathoms. Other forms from the same locality include *Laevicardium (Laevicardium) mortoni* Conrad, *Pusula (Niveria) quadripunctata* Gray, and *Triphora (Triphora) bermudensis* Bartsch.

I am grateful to Dr. Paul Bartsch and Dr. Harold A. Rehder of the United States National Museum for aid in the identification of certain forms. Lieutenant Colonel A. J. Peile kindly sent me a copy of his *Mollusca of Bermuda* (Proc. Mal. Soc., Lond., **17**, pp. 71–98, 1926), brought up to date and corrected by his own hand.

Additions to the Bermudian fauna consist of the following species:

Cerithium (Vulgocerithium) semiferrugineum Lamarck—Grace Island, Castle Harbor, Field Museum No. 13711 (identified by Dr. Harold A. Rehder).

Pusia (Thala?) torticula Dall—Challenger Bank, 28 fathoms, Field Museum No. 13727.

This species was described by Dall (Bull. Mus. Comp. Zool., **18**, p. 162, pl. 15, fig. 8, 1889) as *Mitra (Thala?) torticula* from a single

specimen obtained in living state off Havana, in 400 fathoms; in another publication (Bull. U. S. Nat. Mus., **37**, p. 110, 1889) Dall cites this species in the fossil state from the Florida Keys and from the West Indies. These notes seem to constitute the only information on this little mitrid shell. A dead shell in good condition from the Challenger Bank, Bermuda, fits Dall's diagnosis and figure of *torticula* almost perfectly. According to more recent ideas I refer *torticula* to *Pusia*, preserving, though with hesitation, the subgeneric reference to *Thala*, an otherwise Indo-Pacific subgenus. Examination of the unknown anatomy of *torticula* is required to establish this subgeneric reference, or to place it correctly.

Cymatosyrinx bartschi sp. nov. (pl. 2, figs. *h, i*)

Type from Argus Bank, Bermuda Islands. No. 13672 Field Museum of Natural History. Collected October 13, 1905, by Tarleton H. Bean. A dead shell, in good condition, from a depth of thirty fathoms.

Diagnosis.—A turritid shell of somewhat uncertain generic position, characterized by its short, but slender shape, by the absence of all spiral elements of shell sculpture, by the presence of stout and rather densely set axial ribs which leave free a conspicuous infrasutural constriction, and by a wide, ear-shaped aperture with both an infrasutural and a basal notch on its outer lip and with a rather wide canal at its base.

Comparisons.—The new species does not appear to be closely related to any Atlantic form. I judge it to be most nearly allied to the Californian *Cymatosyrinx ferminiana* Dall (Proc. U. S. Nat. Mus., **56**, p. 7, pl. 8, fig. 4, 1919), from which it differs by the wider ribless infrasutural zone and by the wider aperture with a more pronounced basal notch.

Description of type.—Shell with a silky luster, vinaceous cinnamon, lighter toward the tip, darker toward the base, acute, slender (pl. 2, fig. *h*). Whorls 7¾, the first 1¾ occupied by a smooth, globular, creamy-white nucleus, whose apex is somewhat sunk and thus does

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PLATE 2. a, *Latirus festivus* sp. nov., the sculpture of the surface; × 24. b, *Latirus festivus* sp. nov., paratype, U. S. Nat. Mus. No. 253874; × 4.5. c, *Latirus ernesti* Melville (from Melville's original picture); × 2.5. d, *Mitra roborea* Reeve (from Reeve's original picture); × about 2. e, *Imbricaria olivaeformis* Swainson, Field Museum No. 3915, showing apical sculpture; × 7. f, *Imbricaria vanikorensis* Quoy, Field Museum No. 13210, showing apical sculpture; × 7. g, *Norrisia norrisi* Sowerby, Field Museum No. 7658, young specimen showing apical sculpture; × 5.5. h, *Cymatosyrinx bartschi* sp. nov., Field Museum No. 13672; × 5. i, *Cymatosyrinx bartschi* sp. nov., shape of outer lip; × 6.


a
b
d
e
f
g
h
i

not project above the following part of the first whorl. Only in the nucleus and in the earlier whorls of the postembryonic shell is the suture deep and obvious; in the following whorls it becomes increasingly appressed, producing a smooth, somewhat concave infrasutural zone on the upper edge of each whorl. The whorls are rather strongly and regularly swollen, more so toward the base, and the above-mentioned infrasutural zone produces a marked strangulation at their upper edge. Axial ribs present with no trace of spiral sculpture. The ribs consist of well-defined, rather narrow, somewhat undulate threads, which are wider than the interstices between them. There are fifteen of them on the penultimate whorl. They start just beneath the infrasutural constriction, leaving it almost smooth and only occasionally extending into it. The ribs are less elevated above, where they often bend backward, following the course of the growth lines; the highest part of the ribs lies toward their lower end. The ribs on the body whorl extend over its widest part, gradually fading and finally disappearing toward the base of the shell and toward the aperture. Aperture rather wide, with a rather wide distinct canal. Columella smooth, covered by a thin but obvious callus which extends to the insertion of the outer lip, forming a somewhat pad-like incrassation in the parieto-palatal angle. Outer lip (pl. 2, fig. *i*) with a rounded but marked and short sinus at a distance from the insertion, a uniformly but slightly curved broad central part and a rather abrupt notch at the base; only the central part of the lip is somewhat thickened and slightly bent inward.

Measurements.—Length 10.5, diameter 4.

Discussion.—Dr. Paul Bartsch and Dr. H. A. Rehder have examined the type at my request. They find no turritid form like it in the collection of the United States National Museum. I therefore venture to describe it and to name it in honor of Dr. Bartsch, in recognition of many kindnesses from him. While there is apparently no doubt that we have an undescribed species, its allocation to the genus *Cymatosyrinx* Dall is tentative, the exact systematic position of the shell in question being scarcely recognizable from the poor material at hand.

MARINE SHELLS FROM THE MANDEL CARIBBEAN EXPEDITION

The Mandel Caribbean Expedition of Field Museum visited a number of out-of-the-way islands in the Caribbean. Though only short faunal lists can be given, their publication may be welcome, since the localities visited have seldom, if ever, been mentioned in

malacological literature. The specimens listed were collected by Mr. D. Dwight Davis, Curator of Anatomy in Field Museum.

1. Misteriosa Bank, between Cuba and Swan Island (January 1, 1940).

Sepioteuthis ovata Gabb[1]

2. Coxen Hole, Ruatan, Bay Islands, Honduras (January 4, 1940).

Diodora alternata Say
Modulus angulatus C. B. Adams
Cerithium (Vulgocerithium) muscarum Say
Fasciolaria (Fasciolaria) tulipa Linnaeus

3. Southwest Cay, Glover Reef, off British Honduras (January 18, 1940).

Diodora listeri d'Orbigny
Nerita (Nerita) versicolor Gmelin
Nerita (Nerita) peloronta Linnaeus
Nerita (Theliostyla) tesselata Gmelin
Cittarium pica Linnaeus
Astraea (Lithopoma) americana Gmelin
Littorina (Littorinopsis) angulifera Lamarck
Tectarius (Cenchritis) muricatus Linnaeus
Tectarius (Echinellopsis) nodulosus Gmelin
Cerithium (Vulgocerithium) litteratum Born
Strombus (Strombus) gigas Linnaeus
Polinices (Polinices) lacteus Guilding
Erosaria (Ocellaria) spurca Linnaeus
Dolium (Dolium) perdix Linnaeus
Thais (Stramonita) floridana Conrad
Thais (Stramonita) deltoidea Lamarck
Conus (Rhizoconus) mus Hwass
Aplysia (Aplysia) dactylomela Rang
Arca (Barbatia) barbata Linnaeus
Codakia (Codakia) orbicularis Linnaeus
Cyclotellina (Cyclotellina) fausta Pultney
Sepioteuthis ovata Gabb (?=*sepioidea* Blainville)
Octopus (Octopus) (?)*vulgaris* Lamarck. Too young to permit a correct classification

4. Grand Point, Turneffe Island, British Honduras (January 19, 1940).

Modulus angulatus C. B. Adams
Arca (Scapharca) auriculata Lamarck
Polymesoda (Pseudocyrena) salmacida Morelet
Codakia (Codakia) orbicularis Linnaeus

5. Mujeres Island, Yucatan, Mexico (January 28, 1940).

Fissurella (Cremides) nodosa Born
Diodora listeri d'Orbigny
Nerita (Theliostyla) tesselata Gmelin
Dolium (Dolium) perdix Linnaeus
Thais (Stramonita) deltoidea Lamarck
Columbella (Columbella) mercatoria Linnaeus
Cantharus (Cantharus) auritula Linck
Arca (Navicula) umbonata Lamarck
Arca (Barbatia) barbata Linnaeus
Phacoides (Linga) pennsylvanicus Linnaeus
Chama (Chama) congregata Conrad
Tivela (Tivela) mactroides Born
Venus (Chione) cancellata Linnaeus

6. Cayos de San Felipe, off southwestern Cuba (January 30, 1940).

Codakia (Codakia) orbicularis Linnaeus
Doryteuthis plei Blainville

[1] According to Adam (Siboga Expeditie, 55, pt. 5, Cephalopoda, p. 30, 1939), this species should be called *sepioidea* Blainville.

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NEW TERMITOPHILOUS DIPTERA FROM THE NEOTROPICS

BY CHARLES H. SEEVERS[1]

The subfamily Metopininae of the Phoridae is comprised of many fully winged, free-living species of flies and a remarkable group of species whose apterous or brachypterous females are in the majority of cases inquilines in the nests of social insects. Most of these females show other morphological modifications in addition to the reduction or loss of wings and halteres. The sclerotization of the abdomen is usually very weak; the sterna are unsclerotized in most of the species and the terga are frequently unsclerotized or are very small. The abdomen, which may also be somewhat swollen, thus presents a wide expanse of membranous integument, and in some genera special integumentary glands are present on the dorsum. The eyes are greatly reduced in some species and the members of one genus are without external vestiges of eyes. The males of this group of phorids are unmodified.

The species with which this paper is concerned were collected from termite colonies on Barro Colorado Island, Canal Zone, by Dr. Alfred E. Emerson and at Villavicencio, Meta, Colombia, by the writer. In no instance were the winged males collected, since they do not reside permanently, if at all, in the nests. The following new species are described: *Syntermophora microphthalma, Cryptophora colombiae, Ecitomyia termitoxena, Homalophora guatiquiae, Homalophora metae,* and *Puliciphora termitophila.* The termites with which these beetles were associated were identified by Dr. Emerson, to whom the writer is greatly indebted.

Cryptophora colombiae and *Syntermophora microphthalma* were collected in Colombia from a colony of *Syntermes molestus* Burmeister, in which the royal cell with the king and strongly physogastric queen was on the surface of the ground beneath a log. The eyeless and apterous females of *C. colombiae* were riding about on the backs of the worker termites while the apterous and nearly eyeless females

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of *S. microphthalma* were running rapidly about among the termites. *Cryptophora* was hitherto represented by a single species (*C. coeca* Borgmeier, 1935, p. 488) collected from a marching colony of *Syntermes* sp. at Santa Cruz, Goyaz, Brazil. As Borgmeier points out, blindness is extremely rare among Diptera and was previously unknown in the Phoridae.

The new species of *Ecitomyia* was taken from the galleries of an earthen mound nest of *Anoplotermes* sp. in Colombia. This is the first species of the genus to have been found associated with termites; the other four myrmecophilous species occur with several genera of ants (*Eciton, Pheidole, Solenopsis*) from Texas to Brazil. Two other new Colombian species of phorids, which were taken from large carton nests of *Nasutitermes ephratae* Holmgren, apparently belong to the genus *Homalophora* Borgmeier. One termitophilous Brazilian species and one attaphilous Cuban species have been described. *Ecitomyia* and *Homalophora* are unusual genera in being comprised of both myrmecophilous and termitophilous species.

Puliciphora termitophila, collected from the carton nest of *Nasutitermes ephratae* Holmgren on Barro Colorado Island, is a new species of a large and widely distributed genus. The genus is especially interesting since it appears to be unique in that it is made up of termitophilous, myrmecophilous, and free-living species, which, regardless of the ecological niche in which the female occurs, are morphologically similar (except for specific differences). Of the thirty-five described species of this genus, eight are known only from males, while the remaining twenty-seven species have been described from female specimens or, in some instances, from both sexes. In only eight of the twenty-seven cases where the females were collected were they discovered in the nests of the social insects; six were taken with termites in India, Belgian Congo, Brazil, and Panama, and two Mexican species were collected from the nests of ants. Females of nineteen species of the genus have been collected from dead animals, carrion-scented flowers (*Amorphophallus*), and decaying vegetable material; they were apparently attracted to these substances to oviposit. The following examples will illustrate the ecological situations in which some of the free-living species were discovered: *P. beckeri* de Meijere (Java) was bred from decaying meat; *P. borinquenensis* Wheeler (Puerto Rico, Bahamas, Guatemala) was attracted to decaying insects and mollusks; *P. ossuaria* Schmitz (Brazil) was taken from a bone; *P. africana* Brues (Africa) was bred from rotting stems of pawpaw trees; *P. occidentalis* Melander and Brues was collected in the vicinity of an *Halictus pruinosis*

burrow at Woods Hole, Massachusetts, and on mollusk shells received from Nassau, Bahama Islands.

A study of these brachypterous and apterous Phoridae brings to one's attention a number of interesting biological problems. Since the data concerning the physiology and ecology of the group are very limited at present, the answers are largely a matter of conjecture. The discussions of some of these problems which are presented here are intended primarily to stimulate investigation rather than to draw any conclusions.

It is of fundamental importance to determine whether or not these apterous females are physogastric, since a great deal depends on establishing this point. A comparative morphological study of the adaptations of symphilous termitophiles and myrmecophiles, exclusive of the Phoridae, reveals that physogastry is associated with the former and the presence of trichomes (glandular hairs) almost always with the latter, for example, Staphylinidae. Among the apterous and subapterous species of the Metopininae, myrmecophily seems to predominate, since there have been approximately sixty-six described myrmecophilous species (twenty-three genera), seventeen termitophilous species (nine genera), forty free-living species (five genera) collected from decaying organic matter, and three ectoparasitic species (one genus) associated with African snails. While it is not likely that all of these species are physogastric —the nineteen described species of *Chonocephalus* Wandolleck in which the females are known are free-living and have rather heavily sclerotized abdomens—some of them may well be. If the myrmecophilous species are physogastric, and most of them do have moderately inflated, membranous abdomens suggestive of it, the situation is very unusual. Furthermore, should the species of the aforementioned genus *Puliciphora* be found to be physogastric, a unique condition would be revealed since no other known physogastric insects are free-living.

Physogastry, which is so typical of termites and their guests, results, at least in many instances, from hypertrophy of the fat body and reproductive organs, increase of blood tissue, and greater development of integumental glands. The abdominal sclerites are, as a rule, widely separated and a large area of membranous integument is exposed. The physogastric termites, staphylinid beetles, termitoxenid flies, and other guests, secrete fatty substances through this membranous surface from which it is licked by other individuals of the society. While it has never been demonstrated that the phorid flies produce such an exudate, the wide expanse of membranous

integument leads one to suspect such a function. In many of these phorids, special integumental glands have been discovered on the dorsum of the abdomen, usually associated with the fifth tergum, for example, *Ecitomyia* Brues, *Acontistoptera* Brues. The crescentic slit in the fifth tergum of *Puliciphora* was shown by De Meijere (1912, p. 141) to be the opening of a hypodermal gland located beneath the tergum. No satisfactory explanation of the function of these glands has been given and there is no evidence that the hosts react to an exudate from it. Schmitz (1913, p. 16) did not regard the termitophilous Indian species, *P. velocipes* Schmitz, as physogastric after studying sections of the abdomen, for he found that the swollen condition of the abdomen was due to a large, sucking stomach rather than to hypertrophy of fat body or reproductive organs. It seems to the writer, however, that the reason for the enlargement is unimportant, if it can be shown that a socially important exudate is secreted by the abdomen. The production of an exudate is an adaptation for acquiring social adjustment and it seems as if the term "physogastric" should be restricted to those social insects which secrete such substances from a somewhat swollen, more or less membranous, abdomen. There is still considerable question as to the physiology of exudate production by termitophilous insects. Wasmann and Holmgren advanced the idea that the fatty tissue of the abdomen is the source of the secretion, and this theory was further expanded by Wheeler. These writers suggested that the secretions are released into the blood by which they are carried to the hypodermis where they filter through the chitinous cuticle directly or by way of minute pores. This method of exudation has never been demonstrated but remains a distinct possibility (see McIndoo, 1923), even though Grassé and Lesperon (1938, p. 463) have discounted the idea on the basis of having demonstrated cutaneous glands and special open, gland hairs (adenotrichs) which presumably are responsible for the production of the secretion in the termitophilous beetle larva, *Troctontus silvestrii* Grassé and Lesperon. It seems likely that hypodermal glands will be found to be the source of the exudates in many termitophilous insects, although there may be other mechanisms of exudate production. The physiology of secretion by the social insect guests needs investigation.

The following discussion is intended to raise questions which must be answered should these flies prove to be physogastric, and is, therefore, more or less based on the assumption that they are. On the basis of morphological structure, it seems probable that the inquiline phorids are symphiles that live unmolested in the nests of

termites and ants by virtue of the exudates to which the hosts react favorably because of olfactory or gustatory stimuli. One must not overlook, however, the possibility that the security of the flies is due to their great agility in eluding the mandibles of the termites, since they move about the galleries with great rapidity. If the latter possibility should prove true, the comparison of the abdomen with that of other termitophiles would be entirely misleading, and the modifications of the abdomen must be regarded as non-adaptive.

While it is not difficult to conceive of these flies as being adapted to the termite social system, it is puzzling to note that a number of species of *Puliciphora* are apparently not associated with social insects at all but are independently existing species. The situation becomes more enigmatic when it is recalled that both free-living and guest species show the same "adaptive" features. There is a possibility that intensive collecting in the regions where the free-living species occur might reveal that they also live in the nests of social insects, and that they leave the nests only on occasions. While this may be true in a few instances, it seems only remotely possible that all nineteen free-living species of *Puliciphora* would behave in this manner.

What possible course could evolution have taken to bring about a large genus in which some species are inhabitants of termite and ant colonies while others are not, even though they all seem to possess adaptations for a social life? The following alternatives are suggested as possibilities: (1) That the principal modifications of the females evolved outside the colonies of social insects, and that from time to time individuals invaded the termite nests, became established, and speciated; (2) that the adaptations of the females evolved within the colonies of social insects, and that from time to time individuals left the nest, oviposited in decaying material, and became established outside the colony, where speciation, due primarily to isolation, occurred; (3) that the evolution of these characteristics occurred independently within the colony and external to it. In the absence of direct evidence in favor of any of these alternatives, one must rely largely on speculation.

The following point seems to favor the first alternative in that it tends to make the second unlikely. Although comparatively little is known concerning the extent of distribution of the inquiline species, there does not appear to be enough material to account for the evolution of the free-living species from this stock. We must, however, take into account that the greater number of described free-living species is due, in part at least, to disproportionate collecting,

since the termite nests of many tropical regions have been neglected. Even experienced collectors may overlook these flies, since their small size and rapid movements make them very elusive and since they disappear from view almost as soon as the termite nest is opened. Careful collecting will reveal many more inquiline species and may raise the number to a parity with the free-living species. Even so, it seems somewhat unreasonable to believe that free-living forms could have speciated from inquiline species except after numerous emigrations from the nest in various parts of the world. It is this recurrence of emigrations from the nest that would be difficult to account for, since it seems unlikely that organisms so well integrated in a social system as the termitophiles seem to be, would emigrate from the colony and become established elsewhere very frequently. The widely distributed non-inquiline species would have had to arise from inquiline species innumerable times, unless the distribution and subsequent speciation was very great after only a few emigrations in the different continental areas of the world.

If it should be proved that the inquiline species were derived from stock which had already become modified outside of the nest, it may be that this is a case of preadaptation comparable to that which Hubbs (1938, p. 261) postulates for the evolution of cave-fishes. He notes that, in general, cave-fishes are related to forms which appear to be preadapted to a life in complete darkness, since they have nocturnal burrowing or crevice-seeking habits and possess well-developed tactile and other senses. The catfishes, many of which show varying degrees of loss of eyes and pigment, have nocturnal habits and well-developed barbels, seem to be especially well adapted as precursors of cave-fishes and evidently were ancestral to many of the present-day cave-dwellers.

It seems, however, to be much more difficult to conceive of preadaptation for entrance into a social system. The environmental conditions in which the preadapted fishes live are not markedly different from those of the cave in which the evolved forms live; the differences are largely a matter of degree. On the other hand, the differences between the environment of the termite nest and that of the various niches outside the nest are much greater. It is quite true that one may point to a number of ecological situations such as decaying logs or humus of the forest floor, in which the physical factors may approximate those of the termite nest, but there is no situation where the biotic factors are comparable. It hardly seems as if it would require any special morphological adaptation to meet the physical conditions of the nest, but it must require at least some

adaptation to cope successfully with the biotic factors peculiar to the termite colony. The morphological and physiological modifications of the termitophilous species are those which enable them to become an integral part of the social system, and situations where an animal could become preadapted for this life are somewhat difficult to visualize.

Hubbs points out that there is no reason to believe that the preadaptation of the fishes was complete, since totally blind and unpigmented forms are not known among those he considers to be preadapted for permanent occupation of caves. In the genus *Puliciphora* there are no apparent morphological differences between the inquilinous and free-living species, so it would almost be necessary to assume that preadaptation of the free-living species is virtually complete.

Aside from the genus *Puliciphora* there do not appear to be other cases where free-living species could possibly be regarded as preadapted for termitophily or myrmecophily; unless one wishes to regard the recurrence of termitophily within the same subfamily or tribe, for example, Aleocharinae—as evidenced by the occurrence of independently evolved groups of physogastric genera—as an indication of some less evident preadaptation. There is very frequently adequate material in the nest from which the true guests may be derived, since many of the permanent residents (synoeketes, synecthrans) of termite and ant nests are indistinguishable, as far as special morphological adaptations are concerned, from free-living related species. These species, which are persecuted by the hosts or are merely tolerated, undoubtedly form excellent stock for the derivation of the morphologically modified species. So, in most groups of termitophiles, we do not need to look for preadapted stock from which the symphilous species may be evolved. The situation in caves seems to be different, for, as Hubbs points out, while strays of free-living species of fishes are not infrequently found in caves, there is little ground for supposing that they have become modified into cave-fishes since they are hardly common enough to form a breeding stock and hardly permanent enough to allow for requisite mutation and evolution.

Despite these difficulties, should the free-living species of *Puliciphora* prove to be preadapted for social life, it would be remarkable, since it would be very difficult to account for the origin of physogastry (assuming that they are physogastric) outside of the nest. It is quite plausible, in the case of the inquilines, to attribute adaptive features, such as development of physogastry and integumental glands, to

natural selection, since these are modifications that tend to gain for them colony recognition and would almost certainly have selective value. Among non-inquiline forms, however, it is not clear how these characters could have selective value. Reduction and loss of wings, halteres, and eyes are not as difficult to account for since they may well be non-adaptive changes which are likely to occur in the absence of selection, either for or against them, when mutation pressure is in that direction. Additional factors are, of course, important in the evolution of non-adaptive vestigial structures; one of the most significant of these is the multiple effects of genes. Since genes exert effects on many characters, the genes or gene combinations influencing degenerative changes may well be selected for their beneficial effects on the organism (for discussions of degenerative evolution, see Wright, 1929, 1934; Darlington, 1936; Emerson, 1938). The distribution of these flies seems scarcely to have been impaired by aptery—consider the wide range of some of the genera.

The following account of termitophily in the genus *Diploneura* seems to indicate a very different trend from that proposed in the first alternative in the case of *Puliciphora*. In this instance, if the meager data can be regarded as significant, the major evolutionary changes appear to have occurred in the nest. *Diploneura* is a large genus of the subfamily Phorinae in which the females and males are for the most part typical, free-living, winged phorids. There are, however, several species of the genus (subgenus *Dohrniphora*) from widely separated localities (ten Brazilian, three Indian, three Australian, and one African species), which are recorded as having been collected in or very near termite nests. These species do not differ in any appreciable respect from the non-termitophilous species, except in a few instances. It seems that a majority of the imagos of these termitophilous species are primarily free-living and enter the nests only at certain times. Borgmeier (1925, p. 91) states that the females of some of the Brazilian species enter the nests in order to oviposit. Presumably, it is in reality the larvae of these species which are termitophilous; there is no reason to believe that they are parasitic on the termites.

There are cases in this genus in which the females have apparently become permanent residents of the nest, for, according to Schmitz (1929, p. 108), the females of *Diploneura schmitzi* Kohl of Belgian Congo live permanently in the carton nest of termites. Recently, Fuller and Lee (1938, p. 75) discovered the apterous females and larvae of a species (*Diploneura gynaptera* Fuller and

Lee) in the mounds of *Nasutitermes (=Eutermes) exitiosus* Hill in Australia. It seems evident in this case that the females and larvae are regular inhabitants of the colony, and that the larvae are not parasitic.

If any inference may be drawn from these few cases, it is that the initial stage in the evolution of termitophily in this genus is the adaptation of the larva to the social life of the colony, the winged females entering the nests only to oviposit. In time, presumably, some of the females become adjusted to the social life even though at first they may not show any gross morphological adaptations. The completion of the adaptation of the female by the development of physogastry and other characteristics is not very difficult to account for. The fact that in only relatively few cases has this evolution progressed very far in this genus suggests a recent invasion of the nests by them.

In conclusion, the writer wishes again to emphasize that the data concerning these apterous flies are too limited to warrant more than the suggestion of problems to be answered. The status of the inquiline Phoridae in the termite and ant societies is a mystery, which can be solved only by careful observations upon living colonies.

Syntermophora gen. nov.

Type of the genus.—Syntermophora microphthalma sp. nov.

Description.—Head broadly triangular, all angles rounded. Head bearing four postantennal bristles and an occipital row of six setae. Ocelli absent. Eyes very small, composed of from four to six ommatidia. Proboscis short and thin, bifid. Palpi moderately broad, spatulate, setose. Antenna of usual form, arista approximately three times the length of the globose third segment, plumose. Head, thorax and terga rather densely clothed with fine hairs.

Thorax rectangular, more than twice as wide as long, bearing only a few pairs of setae. Apterous and halterless. Abdomen very broad, strongly compressed dorso-ventrally. Dorsum of abdomen having four terga rather heavily sclerotized; these terga rather broad, slightly deflexed at the sides. Fifth and sixth abdominal segments largely membranous, the fifth with narrow sclerotized strips on the dorsum. Sterna unsclerotized.

Legs of usual type, densely pilose; middle and hind tibiae bearing terminal spurs and several short setae; tarsi with usual hair seams; the metatarsal segment of the hind tarsi with six transverse rows of setae.

Syntermophora microphthalma sp. nov. (fig. 19, *a* and *b*)

Type from Villavicencio, Colombia. In the collection of Field Museum of Natural History. A female. Collected July 16, 1938, by Charles H. Seevers.

Paratype.—A female, same data as the type, in the collection of Charles H. Seevers.

Host.—*Syntermes molestus* Burmeister. Determined by Alfred E. Emerson.

Description.—Body for the most part testaceous; head with a V-shaped, median, brown area from base to apex; terga dark brown. Head broadly triangular, all angles broadly rounded, wider than long (11:7), posterior border broadly but not strongly arcuate. The rounded front bearing four postantennal bristles, the anterior pair proclinate, the posterior pair inserted farther apart so that they are also on the margin of the front. The posterior border bearing six setae; the middle one of the three on each side closer to the outermost bristle, which is the longest and coarsest of the series. Head rather densely clothed with short, moderately coarse hairs. Palpi bearing three strong, anteriorly directed setae, and a number of finer setae. The very small eyes are situated in a membranous area between the dorsum and the genae at the posterior edge of the membranous antennal fossa. Genae with a row of anteriorly directed bristles on the upper border, ten to twelve setae on the anterior border, and scattered smaller hairs.

Thorax wider than long (11:5), slightly wider basally. Thorax evenly and rather densely pubescent. Chaetotaxy as follows: A propleural bristle on each side; a pair of ventrally directed setae near the ventral tip of the propleurae on each side; a pair of erect setae near each posterior angle, the outer one longer; and a posteriorly directed mesopleural bristle at the usual wing site.

Abdomen much flattened, with four dark brown, broad terga. Terga approximately equal in width; the first, third, and fourth subequal in length, the second tergum one-half longer than the others. Terga clothed with many long, fine, recumbent hairs, those on the posterior border longer but little coarser than the others. Dorsal membranous surface of segments five and six rather densely clothed with hairs set in narrow chitinous rings. Ventral surface of abdomen very sparsely setose. Segments beyond the sixth telescoped in the specimens examined.

Measurement.—Length 1 mm.

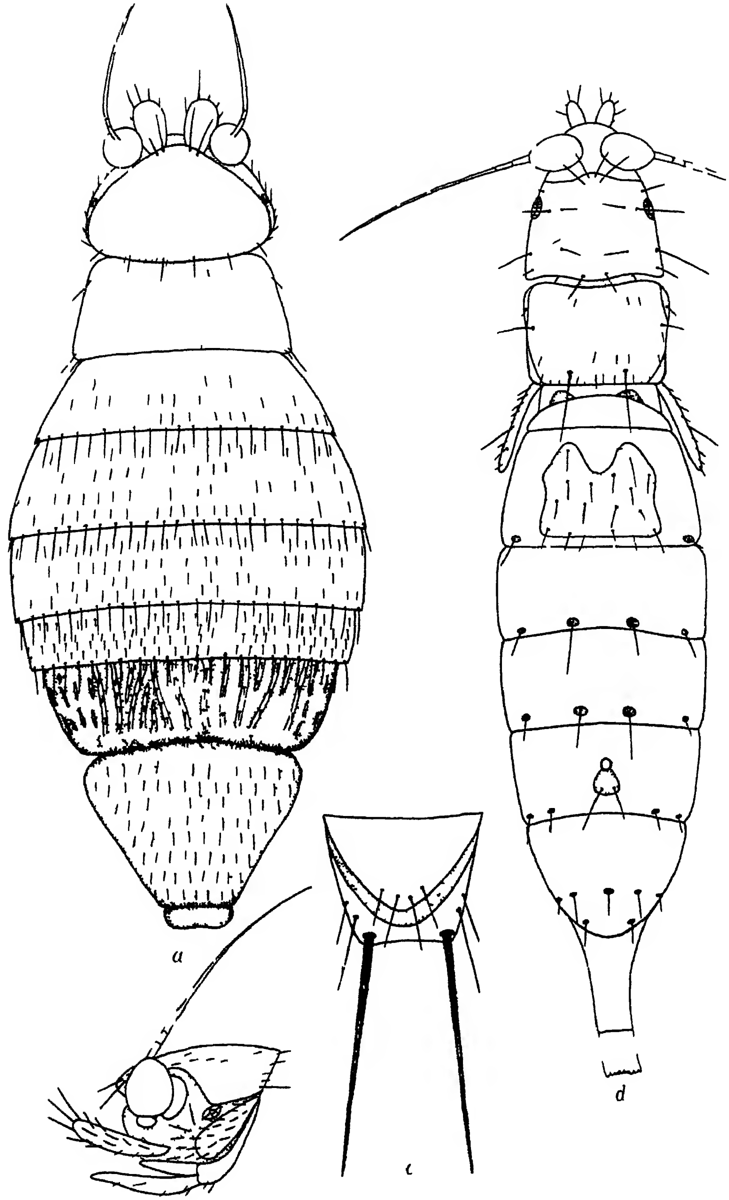

FIG. 19. a, *Syntermophora microphthalma* sp. nov.; dorsal view (membranous areas of abdomen stippled). b, *S. microphthalma* sp. nov.; lateral view of head. c, *Cryptophora colombiae* sp. nov.; fifth tergum. d, *Ecitomyia termitoxena* sp. nov.; dorsal view (sclerotized areas of abdomen stippled; most of abdominal tube omitted).

Cryptophora colombiae sp. nov. (fig. 19, *c*)

Type from Villavicencio, Colombia. In the collection of Field Museum of Natural History. A female. Collected July 16, 1938, by Charles H. Seevers.

Paratypes.—Seven females, same data as the type, three in the collection of Field Museum of Natural History and four in the collection of Charles H. Seevers.

Host.—*Syntermes molestus* Burmeister. Determined by Alfred E. Emerson.

Description.—Head yellowish; the area about the postantennal bristles brown except for a light yellow medial groove which extends on the dusky vertex; the occiput brown especially about the bases of the setae. Postantennal bristles stout, approximately equidistant from one another, the posterior pair distinctly longer; a pair of short, erect setae in the center of this postantennal group. Occipital border bearing three setae on each side, the middle one much the longest; vertex with scattered hairs. Eyes and ocelli absent. Pilosity of the sides of the head very similar to that figured by Borgmeier for *C. coeca*. Palpi with five or six macrochaetae and several finer hairs.

Thorax brown, pleura lighter in color. Pilosity of the thorax as in *coeca*. Thorax convex, broader than long, anterior border rounded, posterior border slightly concave. Abdomen oval, with five terga sclerotized in part. The small, sclerotized fifth tergum (fig. 19, *c*) with a crescentic gland opening is distinctive in form.

Measurement.—Length 1 mm. (1.5 mm. including abdominal tube).

Remarks.—This species is very closely allied to *C. coeca* Borgmeier (1935, p. 488), from which it appears to differ in the form of the fifth tergum and in the pilosity of the palpi.

Ecitomyia termitoxena sp. nov. (fig. 19, *d*)

Type from Villavicencio, Colombia. In the collection of Field Museum of Natural History. A female. Collected July 9, 1938, by Charles H. Seevers.

Paratypes.—Six females, same data as the type, three in the collection of Field Museum of Natural History, and three in the collection of Charles H. Seevers.

Host.—*Anoplotermes* sp. Since only the worker caste was collected, it is not possible to determine the species.

Description.—Head nearly rectangular, a little wider than long; sides nearly parallel, converging somewhat anteriorly; posterior border slightly sinuate laterally. Head light brown except for an irregular, light yellow area medially. Chaetotaxy of the head (fig. 19, *d*) as follows: Two pairs of stout postantennal bristles, the posterior pair slightly farther apart; one preocular bristle on each side; and three transverse rows of four setae each. The first of these rows comprised of a pair of setae medial to each eye, one being directed medially, the other, longer and stouter, being directed laterally. The second row of four a short distance in front of the occipital border, the outermost bristles of this series much longer and stouter than the inner ones. The inner pair of the third (occipital) row much stouter than the fine pair at the posterior angles of the head. Genae with a number of fine yellow hairs. Ocelli absent. Eyes small, composed of from eight to ten facets.

Thorax as wide as the head, rectangular, a little wider than long, sides nearly parallel. Thorax dusky yellow. Wings reduced to small rod-like structures a little shorter than the notum and weakly setose. Chaetotaxy of the thorax as follows: Two widely separated, rather long, semi-erect setae on the posterior border; one weak propleural seta on each side, one much longer seta a short distance posterior to it on the border of the pronotum. Thorax and head finely pubescent.

Abdomen ovoid, largely membranous since the sclerotized areas are very small. Abdominal segmentation is indicated very faintly. First tergum unsclerotized; second rectangular, much narrower than usual, feebly sclerotized in front, anterior border emarginate; the sclerotization of the third and fourth terga is limited to two small areas about setigerous punctures. The sclerotization of the fifth tergum is represented by a small, trapezoidal area caudad to a circular, chitinous-rimmed gland opening. Sixth tergum and the sterna unsclerotized. The tergum of the second segment bears fourteen to sixteen setae (of which six are in a posterior row), and the fifth bears a pair of moderately strong setae.

The membranous parts of the abdomen sparsely setose, the second and third segments bearing one seta on each side, the fourth and fifth with two on each side, and the sixth segment bearing two irregular rows of setae encircling the abdomen (with approximately ten setae in each circle) and with a short third row (of four, usually) cephalad to the other rows on the ventral side. Venter also bearing a few setae (usually two or three) on the fourth and fifth segments.

Abdominal segments beyond the sixth much more slender, forming a long tube, each segment of the tube with a circlet of fine setae near the terminal border.

Legs similar to those of *wheeleri.* Hind metatarsus with five transverse rows of setae on the plantar surface.

Measurements.—Length 1 mm. (1.5 mm. with abdominal tube extended).

Remarks.—The four desciibed species of this genus are myrmecophiles: *E. wheeleri* Brues (1901, p. 347) occurs with *Eciton coecum* Latreille and *Eciton schmitti* Emery in Texas, *E. manni* Brues (1925, p. 303) with *Pheidole* sp. in Costa Rica, *E. minuscula* Borgmeier and Schmitz (1923, p. 137) with *Solenopsis saevissima* Smeathman and *E. luteola* Borgmeier and Schmitz (1923, p. 139) with *Solenopsis saevissima picea* Wasmann in Brazil.

E. termitoxena differs from these other species in the pilosity of the head, the very weak sclerotization of the third and fourth terga, and the presence of setae on the membranous portions of the abdomen. The small eyes also serve to distinguish this species from *luteola,* the eyes of which are larger than the globose third antennal segment.

Homalophora guatiquiae sp. nov.

Type from Villavicencio, Colombia. In the collection of Field Museum of Natural History. A female. Collected July 11, 1938, by Charles H. Seevers.

Host.—*Nasutitermes* (*N.*) *ephratae* Holmgren. Determined by Alfred E. Emerson.

Description.—Head and abdomen brown, terga dark brown; thorax, mouth parts and legs testaceous. Head with four erect postantennal bristles approximately equal in length, the posterior pair about as far apart as the anterior ones. Head bearing two stout preocular bristles and four setae along the occipital border. The medial pair of this row closely approximated between the posterior ocelli; outer, weaker ones at the posterior angles, a short distance behind the eyes. Dorsum of head moderately clothed with coarse, semierect hairs. Posterior border of the genae bearing a row of small setae.

Eyes elliptical, large, occupying most of the side of the head, setose. Antennal pits deep, extending very close to the median borders of the eyes. Antennae moderate in size, the globose third segment smaller than the eye; the arista long, plumose, about four times as long as the third segment. Palpi slender, bearing six long,

moderately stout setae. Proboscis rather thick, about as long as the head. Ocelli large, forming a triangle enclosing a darker area.

Notum a little more than twice as wide as long, slightly convex, bearing a row of six bristles a short distance behind the middle, the medial two of which are rather close together. The middle seta of the three on each side is twice as far from the median seta as the distance between the median pair and is only a short distance from the stout, posteriorly directed submarginal bristle. Wings and halteres absent.

Abdomen swollen, largely membranous, elliptical in form. Six terga sclerotized, the sixth very feebly so, protruding only slightly from beneath the fifth tergum. First tergum about one-half as long as the thorax. The relative lengths of the first five terga as follows: 2:7:5:4:5; the relative widths: 12:17:16:15:10. No gland opening is apparent in the fifth tergum, although there is a transverse impression at the base. Terga rather sparsely setose; membranous parts of segments three to six with scattered setae set in minute, chitinous rings.

Legs similar to those of *reichenspergeri* except that there are only five transverse, comb-like rows of setae on the hind metatarsus.

Measurement.—Length 1 mm.

Homalophora metae sp. nov.

Type from Villavicencio, Colombia. In the collection of Field Museum of Natural History. A female. Collected July 19, 1938, by Charles H. Seevers.

Host.—*Nasutitermes* (*N.*) *ephratae* Holmgren. Determined by Alfred E. Emerson.

Description.—Head and notum light brown, notum lighter medially, abdominal sclera darker brown. Under parts of head and thorax testaceous, membranous parts of abdomen grayish brown.

Head longer than broad. Eyes elliptical, larger than the third segment of the antennae. Ocelli rather large. Head bearing four postantennal bristles which are nearly equal in length, the posterior pair being farther apart than the anterior ones, two preocular bristles, and four setae along the occipital border. The inner pair of this occipital row is between the posterior ocelli while the outer two are close to the posterior angles of the head. Palpi bearing five moderately stout bristles and some finer ones.

The notum twice as wide as long; the posterior border with a row of six strong setae. The middle bristle on each side midway between

the inner and outer bristles, and half as far from the inner bristle as the distance between the median pair. Wings absent.

Abdomen swollen, elliptical in form, largely membranous. Six terga are sclerotized in part, their relative widths approximately as follows: 10:13:12:9:4.5:2.5; the relative lengths: 2:6:4:4:2:1.5. The fifth tergum is about one-third as wide and as long as the second, and is without a gland opening. Terga clothed with short hairs but without prominent setae. Membranous parts of third to sixth abdominal segments bearing scattered setae set in small, chitinous rings.

Legs similar to those of *reichenspergeri* except that the hind metatarsus is not more than one-half as long as the hind tibia and bears only four and one-half transverse rows of setae.

Measurement.—Length 0.9 mm.

Remarks.—Two species of *Homalophora* have been described: *H. reichenspergeri* Borgmeier (1923, p. 178) was collected from a colony of *Cornitermes* sp. in Brazil and *H. cubensis* Brues (1932, p. 141) was taken with *Atta insularis* Guerin in Cuba.

H. metae differs from the other three species in the size of the sclerotized areas of the fifth and sixth terga; the fifth is relatively small, for it is only one-third as wide and long as the second tergum, while the sixth is relatively large, since it is more than one-half as large as the fifth. The sclerotized area of the sixth tergum of the other species is scarcely perceptible. *H. metae* and *guatiquiae* have only four setae in the occipital row; *reichenspergeri* and *cubensis* have six. All the species have six setae on the notum; the outermost one on each side is just caudad to the middle and very near the lateral border while the other four setae vary in their positions along the posterior border. In *reichenspergeri*, the more lateral of the middle four setae is approximately as far from the inner setae as the distance between the median pair; in *cubensis*, the lateral setae are one-half as far from the inner setae as the distance between the median pair, and are also one-half as far from the median setae as from the lateral border; in *metae*, the lateral setae are also one-half as far from the inner setae as the distance between the median pair, but the lateral setae are about equidistant from the median setae and the lateral border; in *guatiquiae*, the lateral setae are twice as far from the inner setae as the distance between them, and are quite close to the lateral border.

The two new species do not have the wing rudiments which are present in *reichenspergeri*, nor do they have propleural setae. The

ocelli of the new species are apparently larger than in *reichenspergeri*. The hind metatarsus of *reichenspergeri* bears seven transverse combs of setae; both new species have five or less rows.

Puliciphora (Puliciphora) termitophila sp. nov.

Type from Barro Colorado Island, Canal Zone. In the collection of Field Museum of Natural History. A female. Collected August 19, 1935, by Alfred E. Emerson.

Paratype.—A female, same data as the type, in the collection of Charles H. Seevers.

Host.—*Nasutitermes* (*N.*) *ephratae* Holmgren. Determined by Alfred E. Emerson.

Description.—Dorsum of head dark brown; the posterior corners lateral to the ocelli and an oval area on either side of the median line anterior to the ocelli lighter in color. Thorax and legs yellow, the dorsum of thorax light brown. Abdominal terga dark brown, the membranous areas of abdomen gray except for the brown elliptical rings about the setigerous punctures.

Head slightly broader than long, sides subparallel, posterior border straight, anterior border slightly arcuate. Three ocelli present. Macrochaetae arranged on the head as follows: Five on the outer surface of the palpi; four postantennals near the anterior border of the front; two rather weak preocellar setae; two stout setae between the posterior ocelli; one seta medial to each eye and closer to the eye than to the median line; three preocular setae; and two near the posterior corner of the head on each side. Head rather densely clothed with many fine hairs.

Antennae three-segmented; the large third segment globose; the plumose arista about three times as long as the third segment. Eyes moderate in size, with about forty facets, pilose.

Thorax slightly less than twice as broad as long. Thorax bearing eight setae arranged as follows: A pair of rather weak propleural setae; two bristles at the site usually occupied by the wings; two setae at the side borders of the mesonotum and a pair on the posterior border. Thorax finely pilose except for the nearly glabrous sides. Notum rounded in profile, rather weakly sclerotized except for a rather narrow discal area. Pleura weakly developed, the segments distinguishable, however. Wings absent.

Abdomen strongly inflated, twice as wide, at greatest diameter, as the thorax. Abdomen membranous except for sclerotized areas

of six terga; the first tergum very short and the sixth reduced to a small lunule. The relative lengths of the terga are as follows: 1:10:6:6:4:2; the relative widths: 7:9:9:8:5:2. The fifth tergum with a long, crescentic slit, which is, presumably, the opening into a glandular sac beneath. Abdominal segments posterior to the sixth much narrower, telescoped in the specimens examined, the terminal segment bearing a pair of foliate flaps. Terga with a number of recumbent hairs, the posterior border of each bearing longer setae (the second with eighteen or nineteen, the third with from fifteen to seventeen, the fourth with from twelve to thirteen, and the fifth with from nine to eleven). The membranous parts of the abdomen bear short setae arising from setigerous punctures enclosed by elliptical chitinous rings; the sides of the first four segments are glabrous. Sixth and seventh segments encircled by terminal rows of macrochaetae.

Legs rather long, uniformly pubescent throughout. Tibiae with an apical spur. Tarsi elongated, longer than tibiae. Tarsi five-segmented; hind metatarsus about as long as three following segments and bearing six transverse rows of bristles on the plantar surface.

Measurement.—Length 1 mm.

Remarks.—As indicated earlier in the paper, the genus *Puliciphora* is comprised of many species which are distributed through most of the tropical areas of the world. No attempt will be made here to cite references to all the species or to differentiate the new species from any except the most closely related forms. Only five other species of the genus have been associated with termites and *termitophila* is not very closely related to any of them. The other termitophilous species are *P. anceps* Schmitz (India), *P. velocipes* Schmitz (India), *P. termitum* Schmitz (India), *P. spinicollis* Schmitz (Belgian Congo), and *P. bicolor* Borgmeier and Schmitz (Brazil).

P. termitophila is apparently most closely allied to *P. ossuaria* Schmitz (1929, p. 160), of Brazil, and *P. borinquenensis* Wheeler (1906, p. 269), from the West Indies and Central America. It differs from both in the chaetotaxy of the head and terga, and from the latter in the chaetotaxy of the thorax. *P. occidentalis* Melander and Brues (1903, p. 17), which is known from Massachusetts and the Bahama Islands, does not have the sixth tergum sclerotized, and differs in the chaetotaxy. Other New World species (*P. bicolor* Borgmeier and Schmitz, *P. venata* Aldrich, *P. myrmecophila* Brues, *P. nitida* Malloch, *P. glacialis* Malloch and *P. incerta* Silvestri) belong to other subgenera (Schmitz, 1929).

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BIRDS FROM THE YUCATAN PENINSULA

By MELVIN A. TRAYLOR, JR.

In the fall and winter of 1939–40, I made a collection of birds in the states of Yucatan and Campeche in southern Mexico. The trip was made in the company of Mr. E. W. Andrews, who was doing archaeological reconnaissance work for the Carnegie Institution of Washington, and he frequently aided in the collection of specimens.

Collecting was carried on at three stations. Through the courtesy of the Carnegie Institution, we used their headquarters at Chichen Itza, and collecting was done there from October 6 to November 24. From Chichen Itza, we went to Matamoros in southwestern Campeche, and through the kindness of Mr. Cecil Branson, manager of the Laguna Corporation, we made our headquarters there, and collected from December 18 to January 9. From Matamoros we flew to Pacaitun on the Candelaria River, where we were very fortunate in being able to establish our camp in the bodega of Sr. Francisco Rondanini, owner of that "chicle central," and collected there from January 12 to March 1.

The collection, which is deposited in Field Museum, numbers 731 specimens, 287 from northern Yucatan, and 444 from southern Campeche. The species represented are 205 in number, 106 from Chichen Itza, and 167 from Campeche. In the annotated list which follows, I have included twelve species which were seen but not collected, and which raise the Campeche total to 179 species.

I wish to express my thanks and appreciation to Mr. Ludlow Griscom and Mr. James C. Greenway for their kindness and help in the identification of certain species at the Museum of Comparative Zoology; and also to the authorities of that museum and of the Museum of Zoology, University of Michigan, for the loan of valuable comparative material. I am also grateful to Mr. Boardman Conover for the use at all times of his own collections, and for his valuable

aid in the identification of certain game birds; and to Mr. Sydney Camras for his aid in the preliminary identification of many of the birds, and his help in assembling the literature. Particularly, I am indebted to Mr. Rudyerd Boulton and Mr. Emmet R. Blake of Field Museum, without whose constant encouragement and help this paper would never have been completed.

The birds of Chichen Itza have been reported on by Chapman (1896) and Cole (1906). The only paper on the peninsula as a whole is Griscom's *The Ornithological Results of the Mason-Spinden Expedition* (1926) in which he discusses the distribution and relationships of the avifauna of northern Yucatan and the east coast. Campeche, however, has never been reported on separately, the only records being references in Ridgway's *Birds of North and Middle America* to specimens collected at Apazote and the city of Campeche by Nelson and Goldman.

In the state of Campeche, north of a line drawn northeast from Champoton, there is a continuation of the arid conditions of northern Yucatan, which are characterized by open scrub country and low forest, rarely reaching more than thirty-five or forty feet in height. South of this line, however, the forest increases in height and luxuriance, because of the greatly increased rainfall, and although no accurate figures are available, the climate is probably very like that of southern Quintana Roo and northern British Honduras. During our stay the temperature varied from a maximum of 98° (several days during late February) to a minimum of 50° (January 28). This cold period coincided with several *nortes* (cold winds and rains that sweep down from the gulf). Except during the periods of these storms, the temperature rarely drops below 65°.

Collecting conditions at Matamoros were only fair, for although there were many open trails, the presence of the large camp nearby, and the passage of many people over the trails, made the birds rather shy. Conditions at Pacaitun, however, were almost ideal, with many trails leading through the forest and to different *milpas* (Indian cornfields made by clearing and burning the forest), and with the river attracting many water birds which were not seen elsewhere. Although most of my hunting was naturally done in the forests, the *milpas* attracted many birds that might not otherwise have been seen, notably many sparrows, blackbirds, pigeons and woodpeckers, the last frequenting the large dead trees that are left standing in the fields. These trees were also the favorite lookouts of several forms of hawks.

The avifauna of southern Campeche is composed of two main elements: the arid Yucatan fauna from the north, and the northern fringe of the humid tropical fauna from the south. As might be expected in such an intermediate area as this, many species which are assigned either to endemic Yucatan subspecies, or to subspecies from Guatemala or southern Mexico, are in reality intergrades, which seem to favor one or the other form more closely. Allowing

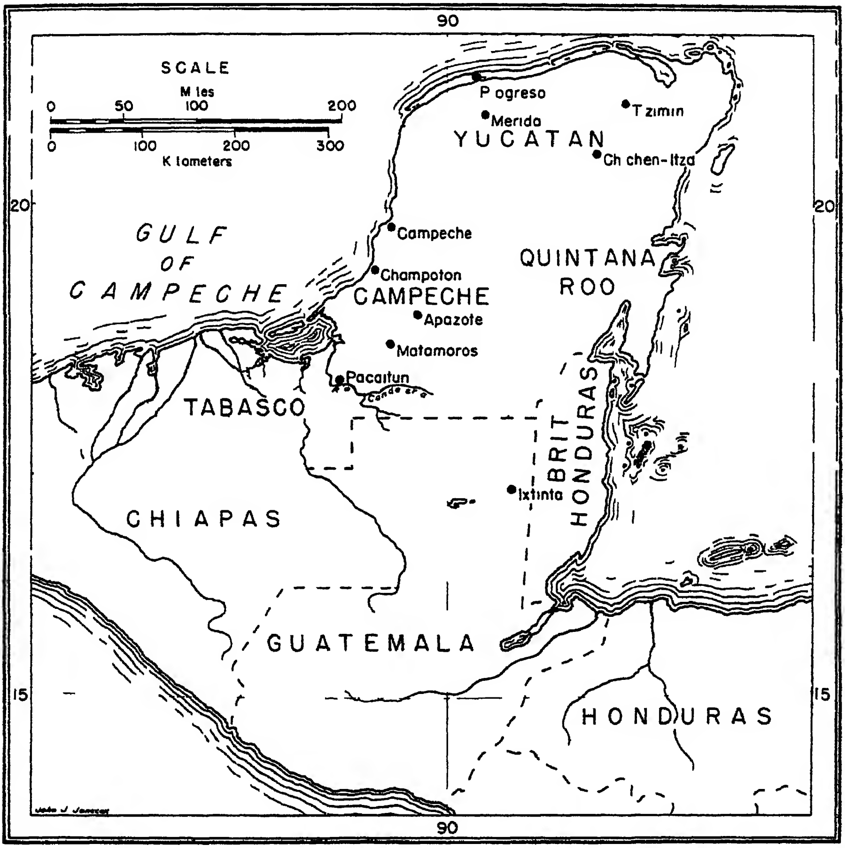

FIG. 20. Localities from which specimens are listed.

for this intergradation, there still seems to be a preponderant Yucatan element. Of the thirty-five species collected, of which endemic subspecies have been named from northern Yucatan, twenty-five belong to the northern races and only ten to those of Guatemala or southern Mexico.

The Yucatan subspecies collected in Campeche were as follows:

Ortalis vetula intermedia
(southern half of peninsula)
Aramides cajanea albiventris
Pteroglossus torquatus erythrozonus
Centurus aurifrons dubius
Centurus rubriventris rubriventris
Dryobates scalaris parvus
Xiphorhynchus flavigaster yucatanensis
Sittasomus griseicapillus gracileus
Dendrocincla anabatina typhla
Thamnophilus doliatus yucatanensis
Formicarius analis pallidus
Attila spadiceus gaumeri
Pachyrhamphus major itzensis
Myiarchus tuberculifer platyrhynchus
Xanthoura luxuosa maya
Thryothorus rutilus canobrunneus
Nannorchilis leucogaster brachyurus
Mimus gilvus clarus
Granatellus sallaei boucardi
Icterus cucullatus igneus
Eucometis penicillata pallida
Saltator coerulescens yucatanensis
Richmondena cardinalis yucatanica

The following Guatemalan or Mexican subspecies were collected in Campeche:

Crypturellus cinnamomeus intermedius
Buteo magnirostris direptor
Momotus lessonii lessonii
Platypsaris aglaiae sumichrasti
Tityra semifasciata personata
Psilorhinus mexicanus cyanogenys
Cissolopha yucatanica rivularis
Habia rubica rubicoides
Habia gutteralis littoralis
Saltator atriceps atriceps

In order to complete the picture of the Yucatan element, there should also be included four species peculiar to the Yucatan peninsula which were found in Campeche, *Agriocharis ocellata, Amazilis yucatanensis, Myiarchus yucatanensis,* and *Piranga roseogularis roseogularis.*

However, this does not give by any means a complete picture, because twenty-one species were collected which are found only in the humid tropical zone and have never been collected in the northern part of the peninsula. These are listed below, the species marked with an asterisk apparently representing the first record from the peninsula.

**Tinamus major percautus*
**Crypturellus soui meserythrus*
**Columba rufina pallidicrissa*
Pionus senilis decoloratus
**Amazona autumnalis autumnalis*
**Phoethornis adolphi adolphi*
Trogon massena massena
Galbula melanogenia
Dendrocolaptes certhia sancti-thomae
**Dysithamnus mentalis septentrionalis*
(first record for Mexico)
**Cercomacra tyrannina crepera*
Manacus candei
**Schiffornis turdinus veraepacis*
Myiobius sulphureipygius sulphureipygius
Henichorina leucosticta prostheleuca
Hylophilus ochraceiceps ochraceiceps
**Chlorophanes spiza guatemalensis*
(first record for Mexico)
Gymnostinops montezuma
Lanio aurantius aurantius
Caryothraustes poliogaster poliogaster
**Cyanocompsa cyanoides concreta*

Naturally these species represent only a small percentage of the Caribbean rain forest fauna, but their presence demonstrates the much closer relationship of this fauna with that of Campeche, than with that of northern Yucatan. In this respect Campeche is intermediate between Yucatan and Peten, where the rain forest ele-

ment is much greater and the endemic forms of Yucatan reach their most southern outpost.

In the following list are species, either wide ranging tropical forms or migrants, which are here recorded for the first time from the peninsula:

Mycteria americana (Pacaitun)
Sarcorhamphus papa (Matamoros)
Rostrhamus sociabilis major (Pacaitun)
Spizaetus ornatus vicarius (Pacaitun)
Spizaetus tyrannus (Pacaitun)
Micrastur ruficollis guerilla (Pacaitun)
Heliornis fulica (Pacaitun)
Ara macao (Pacaitun)
Nyctibius griseus mexicanus (Pacaitun)
Notharchus hyperhynchus dysoni (Matamoros)
Lepidocolaptes souleyetti insignis (Pacaitun)
Myiarchus crinitus (Chichen Itza)
Rhamphocoenus rufiventris rufiventris (Chichen Itza and Matamoros)
Hylocichla mustelina (Pacaitun)
Hylocichla ustulata ustulata (Matamoros)
Anthus spinoletta rubescens (Chichen Itza)
Icterus galbula (Matamoros)

The sequence of families in this report follows Wetmore (Smiths. Misc. Coll., **89**, No. 13, 1934).

LIST OF SPECIES

Tinamus major percautus Van Tyne

Pacaitun, 1 male, 3 females, January 19–February 20.

These birds are identical in coloration with three specimens of the type series which I have had the privilege of examining. They were not uncommon at Pacaitun, but were very wild due to hunting.

Crypturellus soui meserythrus P. L. Sclater

Pacaitun, 2 females, February 2 and 19.

Less common than either of the other tinamous.

Crypturellus cinnamomeus intermedius subsp. nov.

Type from Pacaitun, Campeche, Mexico. Alt. 200 feet. Field Museum of Natural History No. 120805. Adult female. Collected February 23, 1940, by Melvin Traylor, Jr. Orig. No. 819.

Diagnosis.—Above: resembles *C. c. soconuscensis* Brodkorb, and like it differs from all other races, in having a slatish cast to the back, tail coverts, primaries and secondaries; differs, however, from *soco-*

nuscensis by having the light barring paler and more sharply defined. Below: resembles *C. c. goldmani* Nelson, and like it differs from all other races, in having a sharp contrast between the rufous breast and the pale buffy white belly; differs, however, from *goldmani* in having more extensive and clearer white on the throat.

Description of type.—Forehead Blackish Plumbeus,[1] barred with Natal Brown; auricular region and hind neck Army Brown; mantle Fuscous, becoming lighter on upper back and faintly barred with Fuscous-Black; lower back and rump, Fuscous-Black, finely barred with Cinnamon-Buff; tail coverts Fuscous-Black barred with Pinkish Buff; middle and greater wing coverts and secondaries Fuscous-Black, strongly barred with Pinkish Buff; chin and throat white, shading through Snuff Brown to Sayal Brown on upper breast; lower breast Cinnamon-Buff; belly Cartridge Buff, with flanks and sides of belly heavily barred with Bone Brown. Wing 166 mm.; culmen 25.5.

Range.—Southern Campeche, and probably adjoining parts of Tabasco.

Remarks.—The new form is clearly intermediate in color between *goldmani* of northern Yucatan and *soconuscensis* of the Pacific coast of Chiapas, although it is separated from the latter by the highlands of Chiapas, where *vicinior*, a strikingly different form, is found. It is possible, however, that the range of *intermedius* and *soconuscensis* may prove to be contiguous somewhere in Tabasco or the Isthmus of Tehuantepec, from which practically no specimens are available. At present, the closest geographical race to *intermedius* on the mainland of Mexico is *sallaei*, of southern Vera Cruz, which differs in being much browner above, and in having a deep buff wash on the abdomen.

Due to the variation in size, measurements of individual birds are of little diagnostic value. On the whole, *sallaei* and *soconuscensis* seem to average considerably larger than either *goldmani* or *cinnamomeus*, and *intermedius* falls in between. As Conover noted in his description of *vicinior* (Proc. Biol. Soc. Wash., 46, p. 115, 1933) the females of the different races are much more constant than the males, and this certainly holds true in this new race. Whereas the barring on the back of the females is always clear and sharp, in the males it is often mottled or darker buff, with much less contrast. Also the contrast between the rufous breast and pale belly is not as sharp in two of the males, and these approach certain of the paler

[1] Capitalized names of colors are from Ridgway's *Color Standards and Nomenclature*, 1912.

males of *soconuscensis*. The latter race as a whole, however, is much deeper rufous below than any of the others.

At Pacaitun these tinamous were fairly common, and were found throughout the forest. During the dry season in late March and April, however, they are said to be found in large numbers along the banks of the river, after the swamps in the forest have dried up. This is also true of the deer, which are only found at Pacaitun during the dry season.

Specimens examined:

Crypturellus c. cinnamomeus.—7: SALVADOR (Olomega, San Miguel, 2 males, 1 female; Volcan San Miguel, San Miguel, 1 male; Rio San Miguel, San Miguel, 1 male; Volcan Conchagua, La Union, 1 male; Mount Cacaguatique, Morazan, 1 female).

Crypturellus c. soconuscensis.—11: MEXICO (Chiapas, Escuintla, 8 males, 3 females).

Crypturellus c. sallaei.—6: MEXICO (Jalapa, Vera Cruz, 2; Orizaba, Vera Cruz, 2; Precedio, Vera Cruz, 1 female; Pasa Neuva, Vera Cruz, 1 male).

Crypturellus c. intermedius.—9: MEXICO (Pacaitun, Campeche, 4 males, 5 females).

Crypturellus c. goldmani.—8: MEXICO (Chichen Itza, Yucatan, 1 male, 4 females; La Vega, Yucatan, 2 females; Puerto Morelos, Quintana Roo, 1 female).

Ardea herodias subsp.

Seen frequently along the river at Pacaitun.

Butorides virescens virescens Linnaeus

Pacaitun, 1 male, January 22.

Casmerodius albus egretta Gmelin

Common along the river at Pacaitun; one was seen at the sacred *cenote* at Chichen Itza.

Leucophoyx thula thula Molina

The Snowy Egret was not as common as the American, but was seen several times around Pacaitun.

Nyctanassa violacea violacea Linnaeus

Five were seen on a short trip down river from Pacaitun.

Mycteria americana Linnaeus

Fairly common. They were highly esteemed by the natives as food.

Phoenicopterus ruber Linnaeus

On January 11, a flock of ten of these were seen flying over the river near Pacaitun from our airplane. This is apparently the first record for the southwest coast of the peninsula, but Flamingos might be expected to wander this far after the breeding season. They were well known to the natives.

Sarcoramphus papa Linnaeus

One was seen soaring at Matamoros, and when we were flying down to Pacaitun we passed close beside one at an altitude of 1,000 feet.

Coragyps atratus atratus Bechstein

Ubiquitous.

Cathartes aura aura Linnaeus

Quite common, but seen singly rather than in flocks.

Elanoides forficatus subsp.

A flock of nine of these was seen at Pacaitun on February 25. They were flying over the river, slowly working their way upstream, and would frequently swoop down and drink on the wing, like swallows. Several others were seen on subsequent occasions.

Chondroheirax uncinatus uncinatus Temminck

Chichen Itza, 4 males 1 female, October 10 November 2; Matamoros, 1 male, December 21.

This was a surprisingly common hawk at Chichen Itza. Several others were seen, but were too wild to collect.

Rostrhamus sociabilis major Nelson and Goldman

Pacaitun, 1 female, February 6.

This is a very clearly marked race, since this bird is strikingly larger than any specimen of *plumbeus* in Field Museum.

Accipiter bicolor bicolor Vieillot

Chichen Itza, 1 male, November 10.

Accipiter striatus velox Wilson

Chichen, Itza, 1 female, November 3.

Buteo magnirostris conspectus Peters

Chichen Itza, 2 males, 2 females, October 17-November 3.

All these birds are in the immature plumage, with the breast heavily streaked with brown.

Buteo magnirostris direptor Peters and Griscom

Pacaitun, 4 males, 2 females, January 31–February 4.

Three of these birds match exactly a series of *direptor* from Guatemala, two show an approach to *griseocauda*, and one is almost as pale as *conspectus*. Such a mixture is to be expected in an area that is intermediate between the three races, and it is a matter of choice whether to say that all three forms are found here, or that these birds are intermediates showing the closest approach to *direptor*.

Buteo[1] nitida[2] micrus Miller and Griscom

Chichen Itza, 1 female, November 24; Matamoros, 1 male, January 2.

Both these birds, and two others from Yucatan in the Field Museum collection fall well within the size limits of the smaller southern race, and the single tail bar in the Matamoros bird bears out the size criterion.

Hypomorphnus urubitinga ridgwayi Gurney

Pacaitun, 1 male, 1 female, February 1.

Spizaetus ornatus vicarius Friedmann

Pacaitun, 1 female, January 21.

Andrews, while at Tizimin, in northern Yucatan, saw one of these birds that had just been shot by an Indian. Unfortunately he had no opportunity to preserve it, but its presence there gives a surprising extension of range for this species.

Spizaetus tyrannus Wied

Pacaitun, 1 female, January 19.

Circus cyaneus hudsonius Linnaeus

Chichen Itza, 1 female, November 1.

Herpetotheres cachinnans chapmani Bangs and Penard

Pacaitun, 1 male, 1 female, January 13 and February 10.

Not uncommon.

[1] Van Rossem (Bull. Mus. Comp. Zool., 77, p. 429, 1934) shows that if *Rupornis* is to be combined with *Buteo*, for the sake of consistency *Asturina* must be also.

[2] Peters, Check-list, 1, p. 240.

Micrastur semitorquatus naso Lesson

Pacaitun, 1 female, February 17.

This was one of a pair that were calling back and forth in the heavy forest near a *milpa*. The male flew before it could be collected.

Micrastur ruficollis guerilla Cassin

Pacaitun, 1 male (imm.), January 30.

This rare little hawk landed on a log in dense forest about twenty feet from where I was sitting.

Falco albigularis albigularis Daudin

Chichen Itza, 1 female, October 31; Pacaitun, 1 female, January 15.

Falco sparverius sparverius Linnaeus

Chichen Itza, 1 male, 3 females, October 8 November 16; Matamoros, 1 female, December 26; Pacaitun, 1 male, February 10.

Penelope purpurascens purpurascens Wagler

One was shot at Matamoros, and another at Pacaitun, but neither was preserved.

Ortalis vetula pallidiventris Ridgway

Chichen Itza, 4 males, 2 females, October 21-November 17.

Ortalis vetula intermedia Peters

Matamoros, 1 male, 3 females, December 18 January 1.

Three of these birds are identical in color with specimens from Quintana Roo and Peten. The fourth is as pale below as *pallidiventris* of Yucatan, but retains the isabelline tips on the tail feathers, as in *intermedia*.

Colinus nigrogularis nigrogularis Gould

Chichen Itza, 1 male, 3 chicks, November 4 7.

The chicks were very young, not more than two or three days old, and were unable to fly. All three were caught on November 4, but we were unable to keep them alive, and the last one died three days later.

Odontophorus guttatus guttatus Gould

Pacaitun, 1 male, 2 females, January 24-February 23.

Agriocharis ocellata Cuvier

Pacaitun, 1 female, January 17.

Twice flocks of fifteen or twenty birds were seen in a *milpa* by the edge of the forest. The species was also seen at Chichen Itza, but was very wild due to being hunted so much.

Aramides cajanea albiventris Lawrence

Pacaitun, 2 males, January 28 and February 24.

Porphyrula martinica Linnaeus

Matamoros, 1 male, December 26.

Heliornis fulica Boddaert

Pacaitun, 1 male, January 21.

Jacana spinosa gymnostoma Wagler

Matamoros, 1 female, December 31.

Charadrius vociferus vociferus Linnaeus

Chichen Itza, 1 female, October 24.

The Killdeer was also found at Pacaitun, where a flock of half a dozen was seen at the "airport" every day.

Erolia minutilla Vieillot

Pacaitun, 1 male, January 23.

Columba flavirostris flavirostris Wagler

Chichen Itza, 1 male, October 17; Pacaitun, 1 male, January 28.

Columba rufina pallidicrissa Chubb

Pacaitun, 1 male, 1 (?), January 28 and February 3.

This pigeon was usually found in flocks with *flavirostris*, but was always in the minority.

Zenaida asiatica asiatica Linnaeus

Chichen Itza, 2 females, November 13 and 22.

Columbigallina passerina pallescens Baird

Chichen Itza, 1 male, 1 female, October 26.

Columbigallina talpacoti rufipennis Bonaparte

Chichen Itza, 1 male, October 25; Matamoros, 1 male, December 20.

Claravis pretiosa Ferrari-Perez

Chichen Itza, 3 males, 2 females, November 7–21; Matamoros, 2 males, 2 females, December 23–24; Pacaitun, 1 female, February 9.

At Chichen Itza these birds could be found in the *milpas* by twos and threes when the corn was being gathered; in Matamoros and Pacaitun flocks of fifteen or twenty were not uncommon.

Leptotila verreauxi fulviventris Lawrence

Chichen Itza, 1 male, 1 female, October 14 and November 8; Matamoros, 1 female, December 23; Pacaitun, 1 male, February 10.

Oreopelia montana Linnaeus

Pacaitun, 2 females, February 17 and 25.

Ara macao Linnaeus

At Pacaitun several pairs were seen flying overhead at various times. They were usually along the river, but one pair was seen several miles back from the river in the forest.

Aratinga astec astec Souance

Chichen Itza, 2 males, November 1; Matamoros, 1 male, 1 female, December 22.

Pionus senilis decoloratus Griscom

Matamoros, 3 males, 1 female, December 21 January 4.

Although only a few specimens of typical *senilis* have been available for comparison, these birds are as dark as any I have seen from Guatemala and Costa Rica, and obviously belong to the southern form.

Amazona xantholora G. R. Gray

Chichen Itza, 4 males, 2 females, 1 imm.(?), October 24 November 11.

Many large flocks of parrots were seen at Chichen Itza, some of them numbering at least a hundred birds. In view of the apparent scarcity of *xantholora*, these must have been flocks mixed with *albifrons*, although as it happened, all the birds shot were *xantholora*. I was not able to distinguish the two forms in flight, the white foreheads on both appearing equally prominent. Although *xantholora* is known from British Honduras, it apparently does not reach southern Campeche.

Amazona albifrons nana W. de W. Miller

Matamoros, 2 males, December 24 and 26.

Amazona autumnalis autumnalis Linnaeus

Matamoros, 1 female, December 23; Pacaitun, 1 male, January 12.

These were seen frequently, but rarely more than one or two pairs together.

Coccyzus americanus americanus Linnaeus

Chichen Itza, 1 male, October 19.

Piaya cayana thermophila P. L. Sclater

Chichen Itza, 2 males, 1 female (imm.), October 10–31; Matamoros, 2 males, 1 female, December 19–January 6; Pacaitun, 1 male, January 20.

Crotophaga sulcirostris sulcirostris Swanson

Chichen Itza, 1 male, October 8; Pacaitun, 1 female, February 11.

Dromococcyx phasianellus rufigularis Lawrence

Matamoros, 1 male, December 25.

Tyto alba pratincola Bonaparte

Chichen Itza, 1 female, October 15.

This bird was shot in the dry *cenote* near Chichen Itza, where it was apparently nesting in one of the small caves about thirty feet up in the wall. The ovary was much enlarged, one of the egg yolks being more than half an inch in diameter.

Otus guatemalae thompsoni Cole

Chichen Itza, 1 female, October 23; Pacaitun, 1 female, February 26.

Both these birds were flushed off the ground in daylight, and lit about four feet up in small trees. The Pacaitun bird shows only a very slight intergradation with *guatemalae*.

Glaucidium brasilianum ridgwayi Sharpe

Chichen Itza, 2 females, October 25 and 29; Matamoros, 1 male, 1 female, December 22 and 31; Pacaitun, 1 female, January 29.

Nyctibius griseus mexicanus Nelson

Pacaitun, 1 male, January 17.

Nyctidromus albicollis yucatanensis Nelson

Chichen Itza, 1 male, 2 females, October 8-November 2; Matamoros, 2 males, December 22.

Phoethornis adolphi adolphi Gould

Pacaitun, 1 female, 1 (?), February 4 and 8.

This little hermit was not so uncommon as only two specimens would indicate, but its minute size made it very difficult to collect in a fit state for preservation.

Pampa pampa pampa Lesson

Chichen Itza, 2 males, 1 female, October 22 November 10; Matamoros, 1 male, 1 female, December 18 and 28; Pacaitun, 2 males, January 29 and February 1.

Although Campeche is included in the range of *curvipennis*, my birds from there are as dark below, and have as short bills, as typical *pampa*, and must be referred to that form.

Agyrtria candida candida Bourcier and Mulsant

Chichen Itza, 2 males, 1 female, 1 (?), October 9 November 16; Matamoros, 2 males, December 29 and January 1; Pacaitun, 1 male, 1 female, January 15 and February 20.

This form, and *Chlorostilbon c. canivetii* were by far the most common hummingbirds, both in Yucatan and Campeche.

Amazilis tzacatl tzacatl De La Llave

Pacaitun, 1 male, 2 females, 1 (?), January 13 22.

Amazilis yucatanensis yucatanensis Cabot

Chichen Itza, 2 males, 1 female, October 18 November 12; Matamoros, 3 males, December 26 January 8; Pacaitun, 1 male, January 31.

Amazilis rutila rutila Delattre

Chichen Itza, 2 females, 1 (?), October 22 November 19.

Chlorostilbon canivetii canivetii Lesson

Chichen Itza, 3 males, 2 females, October 8 21; Matamoros, 1 male, 1 female, December 20 and 26; Pacaitun, 1 male, January 12.

Anthracothorax prevostii prevostii Lesson

Pacaitun, 2 males, 1 female, January 13 30.

Trogon collaris puella Gould

Matamoros, 1 male, 1 female, January 1.

This pair were the only ones seen of this species.

Trogon melanocephala melanocephala Gould

Chichen Itza, 4 males, 1 female, October 10 November 14; Matamoros, 2 males, 2 females, December 19 January 9; Pacaitun, 1 male, 2 females, January 29 February 9.

The most common trogon; one or more seen almost every day in Campeche.

Trogon caligatus sallaei Bonaparte

Chichen Itza, 1 male, 1 female, October 29 and November 3; Matamoros, 2 males, 2 females, December 27-January 6.

Trogon massena massena Gould

Pacaitun, 1 male, January 24.

Megaceryle torquata torquata Linnaeus

Pacaitun, 2 males, January 24 and February 3.

Frequently seen along the river, usually in pairs.

Chloroceryle americana isthmica Goldman

Pacaitun, 1 male, 1 female, January 15 and 24.

These birds are intermediates, but seem closer to *isthmica* than to *septentrionalis*.

Chloroceryle aenea stictoptera Ridgway

Pacaitun, 1 male, 1 female, January 22 and February 7.

This species was not uncommon, but the birds were difficult to collect when flying in and out among the mangrove roots.

Eumomota superciliosa superciliosa Sandbach

Chichen Itza, 2 males, 1 female, October 23 November 1.

Momotus lessonii lessonii Lesson

Matamoros, 2 males, 1 female, December 23-January 2; Pacaitun, 1 male, January 16.

These birds are intermediates between *lessonii* and *exiguus*, of northern Yucatan. Although very little can be determined on the basis of color, because of the wide range of individual variation, in size they average closer to *lessonii*.

Momotus lessonii exiguus Ridgway

Chichen Itza, 2 males, 2 females, October 14 November 15.

Galbula malanogenia Sclater

Pacaitun, 1 female, February 5.

The only one seen.

Notharchus hyperhynchus dysoni Sclater

Matamoros, 1 female, January 3.

One other was seen, in the top of a very tall, dead tree.

Ramphastos sulfuratus sulfuratus Lesson

Chichen Itza, 3 males, 3 females, October 11-17; Matamoros, 2 males, 1 female, December 20-January 8; Pacaitun, 1 female, January 21.

These birds, according to the natives, are very rare at Chichen Itza. The flock from which my specimens were collected numbered between twenty and twenty-five birds, and it stayed in the vicinity for at least two weeks. It was apparently composed almost entirely of young birds, since all the specimens collected were birds of the year.

Pteroglossus torquatus erythrozonus Ridgway

Matamoros, 2 males, 2 females, December 19–January 2.

These birds show no approach whatsoever to typical *torquatus*.

Centurus aurifrons dubius Cabot

Chichen Itza, 1 male, 1 female, October 9 and 14; Matamoros, 2 females, December 20 and January 8; Pacaitun, 1 male, January 19.

The most common woodpecker both in Yucatan and Campeche.

Centurus rubriventris rubriventris Swainson

Pacaitun, 1 male, 1 female, January 26 and February 16.

Much less common than *C. a. dubius*. It was seen at Chichen Itza, though not collected.

Piculus rubiginosus yucatanensis Cabot

Chichen Itza, 1 male, 1 female, October 27 and November 1; Matamoros, 4 males, 1 female, December 21 January 9; Pacaitun, 1 male, January 26.

Much less common at Chichen Itza than in Campeche.

Celeus castaneus Wagler

Matamoros, 2 females, January 6 and 9; Pacaitun, 1 female, January 17.

Ceophloeus lineatus similis Lesson

Matamoros, 1 male, December 22; Pacaitun, 1 female, Jan. 14.

Phloeoceastes guatemalensis guatemalensis Hartlaub

Chichen Itza, 1 male, October 15; Pacaitun, 1 male, February 17.

Veniliornis oleaginus sanguinolentus Sclater

Matamoros, 1 male, December 31; Pacaitun, 1 male, 2 females, January 24–February 20.

Dryobates scalaris parvus Cabot

Chichen Itza, 2 males, 2 females, October 12 30; Pacaitun, 1 male, 1 female, January 23 and February 14.

It was rather surprising to find this bird in southern Campeche, where the forest is much heavier than in the northern third of the peninsula. All that were seen were in *milpas* or other clearings.

Dendrocolaptes certhia sancti-thomae Lafresnaye

Pacaitun, 1 male, 1 female, January 19 and 24.

Xiphorhynchus flavigaster yucatanensis Ridgway

Chichen Itza, 1 male, 3 females, October 6–November 19; Matamoros, 3 females, December 21–January 8; Pacaitun, 1 female, 1(?), February 11 and 28.

Peters (1913, p. 374) says that the majority of the birds of this species that he collected in southern Quintana Roo were closer to *flavigaster*, but my series from Campeche is indistinguishable from *yucatanensis* of northern Yucatan.

Lepidocolaptes souleyetii insignis Nelson

Pacaitun, 1 female, January 26.

Sittasomus griseicapillus gracileus Bangs and Peters

Chichen Itza, 2 males, 1 female, October 9–21; Matamoros, 1 male, December 30; Pacaitun, 2 males, January 13 and 25.

This form and *X. f. yucatanensis* were the most common woodhewers.

Dendrocincla homochroa homochroa Sclater

Chichen Itza, 1 male, October 26; Pacaitun, 1 male, 2 females, January 16 March 1.

Dendrocincla anabatina typhla Oberholser

Pacaitun, 1 male, 2 females, February 4 20.

These birds are intermediate in coloration, but seem to be closer to *typhla*.

Synallaxis erythrothorax erythrothorax Sclater

Pacaitun, 2 males, 1 female, January 27–February 14.

Xenops minutus mexicanus Sclater

Pacaitun, 3 males, 2 females, February 1–26.

Thamnophilus doliatus yucatanensis Ridgway

Chichen Itza, 2 males, 1 female, November 7–16; Matamoros, 1

male, December 27; Pacaitun, 3 males, 4 females, January 26 February 24.

Here again we are dealing with a group of birds which are intermediates. The three males from Pacaitun are darker than those from Chichen Itza, and one of them, if it stood alone, could probably be called *mexicanus*. However, the Campeche series as a whole is closer to *yucatanensis*, and it seems preferable to place them all under that name. This antbird was fairly common, being found mostly in scrubby undergrowth.

Dysithamnus mentalis septentrionalis Ridgway

Pacaitun, 2 males, February 15 and 23.

As far as I can learn, this is the first Mexican record for this antbird.

Cercomacra tyrannina crepera Bangs

Pacaitun, 3 males, 1 female, February 19 22.

This bird had a rather odd distribution at Pacaitun. It was fairly common for a short stretch of trail east of the camp, but was seen nowhere else in the forest. There were no apparent differences in vegetation or topography that would account for this.

Formicarius analis pallidus Lawrence

Matamoros, 1 male, 2 females, December 24- January 6; Pacaitun, 2 males, 1 female, February 1–9.

Although I have not had an opportunity to compare these birds directly with specimens of *pallidus*, they differ markedly from *intermedius* and *moniliger* by having practically no rufous on the back, and by being paler below. Since these are the diagnostic characters of *pallidus*, I feel no hesitation in assigning them to that form. These birds were fairly common at Matamoros and Pacaitun; like the tinamous they preferred to escape by running, flying only when hard pressed.

Attila spadiceus gaumeri Salvin and Godman

Chichen Itza, 1 male, November 24; Matamoros, 3 males, 2 females, December 19–January 9; Pacaitun, 1 male, 1 female, January 15 and February 14.

These birds, with the exception of the one from Chichen Itza, are intermediates between *gaumeri* and *flammulatus*, but seem to be closer to the former. They are slightly smaller than *flammulatus*,

and are less rufous above, particularly on rump and tail. Only two have any yellowish wash on the breast.

Pachyramphus major itzensis Nelson

Chichen Itza, 1 male, November 15; Pacaitun, 1 female, February 14.

Platypsaris aglaiae sumichrasti Nelson

Matamoros, 1 male, January 6; Pacaitun, 1 female, January 31.

The Pacaitun bird is still immature and has the pileum clearly defined, but the Matamoros bird is fully adult and has the pileum and upper back jet black, and the pink on the breast restricted.

Platypsaris aglaiae yucatanensis Ridgway

Chichen Itza, 2 males, 3 females, November 2 21.

Tityra semifasciata personata Jardine and Selby

Matamoros, 3 males, 2 females, December 29 January 8; Pacaitun, 1 male, 1 female, January 12.

Tityra semifasciata deses Bangs

Chichen Itza, 1 male, 2 females, October 9-23.

None of these specimens is actually separable from a large series of *personata*, although they are topotypes of *deses*. However, there is a male in Field Museum from "Yucatan," which shows the described characters of paler back and nearly white under parts very clearly. It seems that this is a rather weak race in which the characters are found in only a limited number of specimens.

Erator albitorques fraserii Kaup

Chichen Itza, 1 male, 1 female, November 16 and 21; Matamoros, 1 male, December 27.

Pipra mentalis mentalis Sclater

Matamoros, 3 males, December 27 January 3; Pacaitun, 2 males, 2 females, January 15 27.

Manacus candei Parzudalri

Pacaitun, 1 male, February 14.

Schiffornis turdinus verae-pacis Sclater and Salvin

Pacaitun, 4 males, January 15-February 9.

Two of these birds were in breeding condition. This species was surprisingly common, considering that it has been recorded only once before from Mexico, at Playa Vicente, Vera Cruz.

Pyrocephalus rubinus blatteus Bangs

Progreso, 1 male, 1 female, March 19.

This pair was collected just outside of Progreso on one of our many attempts to settle our customs difficulties. Vermilion flycatchers, almost certainly belonging to this subspecies, were seen several times at Pacaitun, but I was unable to collect any.

Tyrannus melancholicus chloronotus Berlepsch

Chichen Itza, 2 males, 1 female, October 12–30; Matamoros, 1 female, January 1.

One of the male birds from Chichen Itza had the mandible deformed, so that it hooked over like a cross-bill. Although it was in otherwise healthy condition, it was unable to pick off lice, and consequently was infested with them.

Megarhynchus pitangua mexicanus Lafresnaye

Chichen Itza, 1 male, 1 female, October 11 and 13; Matamoros, 1 male, 2 females, December 19–January 4; Pacaitun, 1 female, February 3.

Miozetetes similis superciliosus Bonaparte

Chichen Itza, 1 female, October 14; Matamoros, 2 males, December 26 and January 8.

Pitangus sulfuratus guatimalensis Lafresnaye

Matamoros, 2 males, January 2 and 5; Pacaitun, 1 male, February 10.

These birds are definitely representatives of the smaller, darker, southern form. One of the Matamoros specimens was feeding in the midst of some army ants.

Myiarchus crinitus Linnaeus

Chichen Itza, 2 males, November 7 and 11.

This is the first recording of the Crested Flycatcher from Yucatan.

Myiarchus tyrannulus nelsoni Ridgway

Chichen Itza, 3 females, October 28-November 22.

These are slightly darker above than the series of skins in Field Museum, but since all of the latter are thirty years old, this is undoubtedly due to fading.

Myiarchus yucatanensis Lawrence

Chichen Itza, 1 male, October 28; Matamoros, 1 male, December 18; Pacaitun, 2 males, January 23 and February 14.

This is a considerable extension of range for this species, which previously was known only from the northern third of the peninsula.

Myiarchus tuberculifer platyrhynchus Ridgway

Chichen Itza, 2 males, 4 females, October 7–November 14; Pacaitun, 4 males, 1 female, January 23–February 14.

The rapid plumage changes effected by wear are well illustrated by these two series, for contrary to the usual situation, the fall birds from Chichen Itza are darker yellow below than the winter birds from Pacaitun.

Myiochanes cinereus brachytarsus Sclater

Pacaitun, 1 male, February 3.

Empidonax minimus Baird

Chichen Itza, 2 males, 1 female, October 6–7; Matamoros, 1 male, December 21.

Myiobius sulphureipygius sulphureipygius Sclater

Pacaitun, 1 male, 2 females, February 11–26.

Onychorhynchus mexicanus mexicanus Sclater

Chichen Itza, 1 male, November 9; Matamoros, 1 female, December 28; Pacaitun, 1 female, February 27.

The female from Pacaitun was only wing-tipped, and when finally captured gave an excellent demonstration of the crest display, which is so well described in the Biologia Centrali-Americana. The crest was erected into a wide semi-circle, and the head was rotated slowly back and forth, giving a very weird effect.

Platyrinchus cancrominus Sclater and Salvin

Pacaitun, 1 male, February 15.

Tolmomyias sulphurescens cinereiceps Sclater

Pacaitun, 1 female, February 24.

This specimen is rather curious in having several white feathers in the crown. There is no other sign of albinism.

Rhynchocyclus brevirostris brevirostris Cabanis

Pacaitun, 1 male, 1 female, January 26 and February 17.

Todirostrum cinereum finitimum Bangs

Pacaitun, 1 female, January 24.

Oncostoma cinereigulare cinereigulare Sclater

Pacaitun, 1 male, 2 females, February 12 27.

Elainea flavogaster subpagana Sclater and Salvin

Pacaitun, 1 male, February 3.

This specimen is very different from the general run of *E. f. subpagana.* It is a very pale bird; the belly has only a light yellow wash, and the throat is a very pale gray, almost white. Above there is only a slight olive tinge, and the wing bars and edgings on the secondaries are very light grayish brown, without any trace of olive or buff. The wing and tail measurements are well within the range of *subpagana,* although the exposed culmen is 12+ mm., about the maximum for the group. I have not been able to match this with any specimens of *subpagana* that I have seen, but for lack of series, it must obviously be referred to that form.

Pipromorpha oleaginea assimilis Sclater

Chichen Itza, 1 male, November 13; Matamoros, 2 males, 1 female, December 20–24; Pacaitun, 1 female, February 21.

This is the first record of this species from northern Yucatan, although Griscom records it from the east coast (1926, p. 14).

Stelgidopteryx ruficollis ridgwayi Nelson

Chichen Itza, 2 males, 3 females, October 9 November 3.

This is a very well-marked subspecies. At least a hundred or more of these birds roosted under the porch roof at the hacienda, and one was collected in a large cave in a *cenote.*

Iridoprocne albilinea Lawrence

Pacaitun, 1 male, January 15.

This swallow was very common along the river.

Psilorhinus mexicanus cyanogenys Sharpe

Matamoros, 1 female, December 19; Pacaitun, 1 male, 1 female, January 24 and 27.

This bird is as much of a pest as our own Blue Jay, following the hunter for long distances and scaring everything away with its screaming.

Xanthoura luxuosa maya van Rossem

Chichen Itza, 1 male, 1 female, October 17 and 23; Matamoros, 3 females, December 24 January 1.

The Matamoros specimens show no approach in size to *centralis* of Guatemala and northern Honduras.

Cissolopha yucatanica yucatanica Dubois

Chichen Itza, 1 male, 1 female, October 21 and November 24.

Cissolopha yucatanica rivularis Brodkorb

Matamoros, 1 male, 1 female, December 24.

Only the male is fully adult and with the black bill, but its measurements are slightly larger than the maximum of a series of eight birds from northern Yucatan. There is only a slight color difference in the male, and none in the female.

Thryothorus albinucha albinucha Cabot

Chichen Itza, 1 male, November 20.

Thryothorus rutilus canobrunneus Ridgway

Chichen Itza, 2 males, 1 female, October 12–November 12; Matamoros, 2 males, December 21 and January 8; Pacaitun, 1 male, 1 female, January 25 and February 2.

The birds from Campeche begin to show an approach to *umbrinus* in the intensity of spotting on the breast.

Henichorhina leucosticta prostheleuca Sclater

Pacaitun, 1 male, February 1.

Nannorchilus leucogaster brachyurus Lawrence

Chichen Itza, 2 males, 3 females, October 6–26; Matamoros, 2 males, December 31 and January 3; Pacaitun, 2 males, 1 female, January 19 February 13.

Melanoptila glabrirostris Sclater

Chichen Itza, 1 (?), October 18.

This is the first record of this form from Chichen Itza, as it is confined to the coast for the most part. However, it has been reported from Ixtinta in Peten by Van Tyne (1935, p. 36) so it may range farther inland than has been expected.

Dumetella carolinensis Linnaeus

Chichen Itza, 2 males, October 17 and 18; Matamoros, 1 male, January 9.

One of the commonest winter visitants.

Mimus gilvus clarus van Rossem

Pacaitun, 1 male, 2 females, January 12 February 3.

Turdus grayi tamaulipensis Nelson

Chichen Itza, 1 male, October 11; Pacaitun, 1 male, 1 female, January 16 and 25.

Hylocichla mustelina Gmelin

Pacaitun, 1 male, January 25.

A common winter visitant.

Hylocichla ustulata ustulata Nuttall

Matamoros, 1 male, 1 female, December 20 and 22.

Polioptila caerulea deppei van Rossem

Chichen Itza, 2 males, October 7 and 24; Pacaitun, 1 male, February 12.

Ramphocaenus rufiventris rufiventris Bonaparte

Chichen Itza, 2 males, November 9 20; Pacaitun, 1 male, 1 (?), January 18 and 21.

It is rather surprising that there are no records of this bird from northern Yucatan, a region that has been thoroughly collected, since I found it not uncommon at Chichen Itza.

Anthus spinoletta rubescens Tunstall

Chichen Itza, 1(?), November 1.

This was a rather unexpected migrant. It was collected by Mr. Andrews, along the road from Chichen Itza to Piste.

Vireo griseus griseus Boddaert

Chichen Itza, 2 males, 1 female, October 10 November 5; Matamoros, 1 male, December 20; Pacaitun, 1 female, January 20.

Vireo flavifrons Vieillot

Chichen Itza, 1 female, October 6.

Hylophilus ochraceiceps ochraceiceps Sclater

Pacaitun, 2 males, February 4 and 11.

Hylophilus decurtatus decurtatus Bonaparte

Pacaitun, 1 male, February 13.

Cyclarhis gujanensis yucatanensis Ridgway

Chichen Itza, 5 males, October 19–November 12.

This species seems to prefer scrubby brush.

Chlorophanes spiza guatemalensis Sclater

Pacaitun, 1 female, January 31.

This is the first record of this species from Mexico. Only one was seen.

Mniotilta varia Linnaeus

Chichen Itza, 1 male, 1 female (?), October 12–November 9; Pacaitun, 1 female, January 27.

Protonotaria citrea Boddaert

Chichen Itza, 2 males, October 7 and 18.

Limnothlypis swainsonii Audubon

Pacaitun, 1 male, January 15.

Compsothlypis americana pusilla Wilson

Pacaitun, 1 male, January 30.

Dendroica aestiva rubiginosa Pallas

Pacaitun, 1 male, February 19.

Dendroica magnolia Wilson

Chichen Itza, 1 male, October 7.

Dendroica pensylvanica Linnaeus

Chichen Itza, 2 males, 1 female, October 6–9.

This warbler has been recorded only once before from Yucatan.

Seiurus aurocapillus aurocapillus Linnaeus

Chichen Itza, 1 male, 1 female, October 24 and November 13; Matamoros, 1 male, December 19.

A very common winter bird.

Oporornis formosus Wilson

Pacaitun, 1 male, January 19.

Geothlypis trichas brachidactyla Swainson

Chichen Itza, 1 female, 1(?), October 8 and 19.

Chamaethlypis poliocephala palpebralis Ridgway

Chichen Itza, 1 male, October 19; Pacaitun, 1 female, February 15.

Icteria virens virens Linnaeus

Chichen Itza, 2 males, 1 female, October 18–November 17; Matamoros, 1 female, December 20.

Granatellus sallaei boucardi Ridgway

Chichen Itza, 2 males (ad.), 2 males (imm.), October 18–Nov. 20; Matamoros, 1 male, 2 females, December 21 January 3.

I was surprised to find this species not uncommon. It was always found near the ground in heavy brush, and consequently was not very easy to collect. The young males are very like the females, having only slightly more slate blue on the back.

Wilsonia citrina Boddaert

Chichen Itza, 1 male, November 12; Matamoros, 1 male, December 21; Pacaitun, 1 female, January 22.

Setophaga ruticilla Linnaeus

Chichen Itza, 2 males, October 25 and 29; Matamoros, 1 female, December 22.

Gymnostinops montezuma Lesson

Pacaitun, 1 male, February 6.

This Oropendola was uncommon, only one other being seen.

Amblycercus holosericeus holosericeus Lichtenstein

Chichen Itza, 1 female, 1(?), October 19 and November 20; Matamoros, 1 male, 1 female, December 25 and 28.

These birds are as much trouble to skin as the woodpeckers, due to the very heavy musculature on the head.

Tangavius aeneus aeneus Wagler

Pacaitun, 2 females, January 18 and February 8.

Cassidix mexicanus mexicanus Gmelin

Chichen Itza, 2 females, November 2; Pacaitun, 1 male, January 21.

Dives dives dives Lichtenstein

Chichen Itza, 1 female, October 30; Pacaitun, 1 male, 1 female, January 18 and February 12.

Icterus galbula Linnaeus

Matamoros, 1 female, December 20.

Icterus spurius Linnaeus

Pacaitun, 1 male, 1 female, January 31.

Several flocks of the Orchard Oriole were seen.

Icterus prosthemelas prosthemelas Strickland

Chichen Itza, 1 male, 2 females, October 27–November 10; Matamoros, 3 males, 2 females, December 18 January 4; Pacaitun, 2 males, 1 female, January 12 February 14.

Only three birds out of this series are adult, the rest showing various degrees of immaturity.

Icterus mesomelas mesomelas Wagler

Matamoros, 1 female, December 18; Pacaitun, 1 female, February 17.

Icterus chrysater chrysater Lesson

Pacaitun, 1 female, January 21.

Icterus auratus Bonaparte

Chichen Itza, 1 male, 1 female, October 27 and 28.

This species was not found in southern Campeche, and it is apparently confined to the northern third of the peninsula.

Icterus gularis yucatanensis Berlepsche

Chichen Itza, 2 males, 4 females, October 7–November 4; Matamoros, 1 male, 1 female, December 29 and January 6.

Icterus cucullatus igneus Ridgway

Pacaitun, 1 male, February 15.

Although I have not seen any specimens of *masoni*, which is found on the east coast of the peninsula and in northern British Honduras, this specimen shows no approach to the characters ascribed to that form, and belongs to the race of northern Yucatan.

Agelaius phoeniceus matudae Brodkorb

Pacaitun, 3 males, 1 female, January 12-February 15.

There is no question that these birds are considerably smaller than the surrounding race, *nelsoni*, of Vera Cruz and northern Yucatan.

Tanagra affinis Lesson

Chichen Itza, 1 male, October 29.

Tanagra lauta lauta Bangs and Penard

Chichen Itza, 2 males, October 12 and 26; Pacaitun, 2 males, January 23 and February 11.

Thraupis abbas Lichtenstein

Pacaitun, 2 males, January 21 and February 14.

Piranga rubra rubra Linnaeus

Chichen Itza, 1 male, 2 females, October 16 November 17; Matamoros, 1 male, January 8; Pacaitun, 1 male, 2 females, January 16 February 8.

A very common winter visitant.

Piranga roseo-gularis roseo-gularis Cabot

Chichen Itza, 2 males (imm.), 2 females, October 10 November 4; Pacaitun, 3 males, 2 females, January 16 February 8.

This species was rather more common than expected. Three of the birds from Pacaitun were shot the same day out of some kind of fruit tree. As a rule, however, they seem to be solitary in habits, since that was the only occasion on which more than one was seen.

Habia rubica rubicoides Lafresnaye

Matamoros, 3 males, 1 female, December 22 January 4; Pacaitun, 2 males, 1 female, January 27 28.

Habia gutteralis littoralis Nelson

Matamoros, 3 males, 2 females, December 18 January 2; Pacaitun, 1 male, January 20.

These birds are intermediate in size between *littoralis* and *peninsularis*, but in color they match *littoralis* quite closely.

Habia gutteralis peninsularis Ridgway

Chichen Itza, 3 males (ad.), 2 males (imm.), 2 females, October 16-November 11.

This was the only ant tanager at Chichen Itza. *H. r. nelsoni* occurs there, but none were seen.

Lanio aurantius aurantius Lafresnaye

Pacaitun, 4 females, January 17-February 23.

No males were seen.

Eucometis penicillata pallida Berlepsch

Pacaitun, 2 males, 2 females, January 24–February 2.

Saltator atriceps atriceps Lesson

Matamoros, 3 males, 1 female, December 18–January 3; Pacaitun, 2 males, February 7 and 10.

Saltator atriceps raptor Cabot

Chichen Itza, 5 males, October 7–November 7.

This series of birds is clearly distinguishable from typical *atriceps* by the paler gray of the under parts; the race *raptor* seems to be a valid one. Griscom, however, fails to recognize it, and possibly it is a weak race in which the diagnostic characters are absent in a certain number of birds.

Saltator coerulescens yucatanensis Berlepsch

Pacaitun, 3 males, 3 females, January 13–February 15.

This species was very common at Pacaitun, but was not seen at Matamoros, only fifteen miles away.

Caryothraustes poliogaster poliogaster DuBus

Pacaitun, 3 males, January 17.

These three birds were collected out of a large flock that was traveling along well up in the trees. Another large flock was seen at a later date, but none were collected from it.

Richmondena cardinalis yucatanica Ridgway

Merida, 1 male, March 19; Chichen Itza, 4 males, 3 females, October 14 28; Matamoros, 2 males, 3 females, December 18–26; Pacaitun, 2 males, 2 females, January 15–February 5.

In this series from the peninsula, there is no variation at all between birds from the north and from the extreme south, and *yucatanica* apparently ranges over the whole peninsula, with the exception of extreme southeastern Quintana Roo, where *flammigera* is found.

Hedymeles ludovicianus Linnaeus

Chichen Itza, 2 males, 1 (?), November 7–18; Pacaitun, 1 male, January 22.

Guiraca caerulea caerulea Linnaeus

Chichen Itza, 1 male, 1 female, 1 (?), October 28–November 19.

The Blue Grosbeak was also common at Pacaitun.

Cyanocompsa parellina parellina Bonaparte

Chichen Itza, 2 males, 1 female, November 8–22; Matamoros, 3 males, 3 females, December 23–January 8; Pacaitun, 2 males, January 12 and 18.

The two Pacaitun males show an approach to *dearborni* in having somewhat brighter blue below, but they are closer to typical *parellina*.

Cyanocompsa cyanoides concreta DuBus

Matamoros, 1 male, January 4; Pacaitun, 2 males, 4 females, January 13 February 28.

Passerina cyanea Linnaeus

Chichen Itza, 2 males, October 24 and November 9; Pacaitun, 1 (?), February 11.

Passerina ciris ciris Linnaeus

Chichen Itza, 4 males, 1 female, October 21–November 15; Matamoros, 1 male, December 21.

Both the Indigo and Painted Buntings were very common winter visitants at all collecting sites.

Sporophila torqueola morelleti Bonaparte

Matamoros, 2 males, December 19 and 24; Pacaitun, 1 male, January 18.

Volatinia jacarina splendens Vieillot

Chichen Itza, 1 male, 1 female, October 16 and 18; Pacaitun, 1 male, January 16.

Spinus psaltria jouyi Ridgway

Chichen Itza, 1 male, November 15.

Arremonops rufivirgatus verticalis Ridgway

Chichen Itza, 1 male, 1 female, November 2.

Arremonops conirostris chloronotus Salvin

Chichen Itza, 2 females, November 1 and 12; Pacaitun, 3 males, January 13–26.

This was the more common *Arremonops* at Chichen Itza, and was the only one seen in southern Campeche.

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TWO NEW BIRDS FROM BRITISH GUIANA

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ASSISTANT CURATOR OF BIRDS

During the late summer and fall of 1938 the writer conducted the Sewell Avery Expedition for Field Museum for the purpose of making a zoological reconnaissance of extreme southern British Guiana. The expedition gained access to this isolated and biologically unexplored mountainous region by ascending the turbulent Courantyne River and its major tributary, the New River. Itabu Creek, a small tributary entering the New River from the south near its headwaters, furnished a means of ingress into the Acary Mountains which separate the Amazon drainage from that of the Essequebo and Courantyne rivers.

A collecting base, known as Boundary Camp, was established near the head of Itabu Creek at an altitude of 2,000 feet. Itabu Creek appears on no published map but the precise position of Boundary Camp can be determined when the survey maps of the Royal Engineers British Guiana Boundary Commission become available. For all practical purposes, however, its location may be considered as approximately 1° 42′ N. Lat., 57° 55′ W. Long., or on the watershed midway between markers No. 89 and 90 of the Boundary Survey.

Approximately half of the expedition's collections were lost in the Courantyne River while descending King William Rapids. Among the five hundred birds which were salvaged are specimens of an undescribed race of a toucan and one of a woodpecker. These birds are of special interest because they represent the only subtropical element found in the mountains of extreme southern British Guiana. The presence of these birds in a region which does not exceed 4,000 feet in altitude, and averages much less, probably can be considered as an extreme extension of the rich subtropical fauna of Mount Roraima and Mount Auyan-tepui, Venezuela.

I am indebted to Mr. John T. Zimmer of the American Museum of Natural History for the loan of comparative material used in this paper and to Mr. E. T. Gilliard of the same institution for furnishing supplementary data.

Capitalized names of all colors used in this paper are from Ridgway's *Color Standards and Nomenclature*, 1912.

Aulacorhynchus derbianus osgoodi[1] subsp. nov.

Type from Boundary Camp, Itabu Creek head, Acary Mountains, British Guiana. Alt. 2,000 feet. No. 120164 Field Museum of Natural History. Adult male. Collected October 7, 1938, by Emmet R. Blake. Orig. No. 7544.

Diagnosis. - Resembles *Aulacorhynchus derbianus whitelyanus* Salvin and Godman of the Subtropical zone of southwestern British Guiana (Kanuku Mountains, Quonga, Merumé Mountains) and southeastern Venezuela (Mount Auyan-tepui, Mount Roraima)[2] but differs from all known races of *derbianus* in the absence of chestnut tips on the central rectrices.

Description of type.—Dorsal parts, including wing coverts and outer webs of remiges, Spinach Green, becoming less bright on the tail. Malar region, lateral portion of mantle and under parts from breast to under tail coverts, including thighs, Scheele's Green. Feathers of throat dull white with tips very faintly tinted with Venice Green. Breast washed laterally and posteriorly with Benzol Green. Ventral aspect of rectrices Ackermann's Green. Under wing coverts and the basal portion of the inner webs of the remiges Citron Yellow; under carpal coverts similar but tinged with green. Oculars and post-oculars Cerulean Blue connected by a white streak above each eye. Mandibles black and Neutral Red, the latter particularly prominent on the culmen and gonys. A narrow white line bounds the mandibles posteriorly. Tarsus blackish. Wing 114; tail 105; culmen 72.

Range.—Known only from the type locality.

Remarks.—The female is known from a single specimen which differs from the male principally in proportions and in the marked reduction of the bluish wash on the breast. Both characters prob-

[1] Named for Dr. Wilfred H. Osgood.

[2] Phelps has shown (Bol. Soc. Venez. Cienc. Nat., 36, pp. 83–95, 1938) that all birds collected at Mount Roraima, with the possible exception of *Zonotrichia capensis macconnelli*, were taken on Venezuelan soil exclusively.

ably are subject to considerable individual variation. Measurements of female: wing 115; tail 112; culmen 59.

Members of this distinct genus are among the best indicators of the Subtropical zone. The discovery of a well-defined race of *derbianus* in extreme southern British Guiana, at an altitude of only 2,000 feet, not only extends the known range of *Aulacorhynchus* more than one hundred miles southeastward from the Kanuku Mountains (British Guiana) but also brings the lower limits of its vertical distribution well within the Tropical zone.

The races of *derbianus* form a closely knit group and exhibit, in some characters, fine shades of differentiation. Comparison of subspecific characters reveals a tendency towards progressive reduction of size and modification of color pattern among the several forms as one moves from west to east. Although toucans are extremely variable in size, the measurements of those now available show a considerable gap between the large, widely ranging Andean stock and the three smaller, more localized races of the east. Within the latter group also, some degree of diminution from west to east is indicated.

Dimensions of the four races are as follows:

A. d. derbianus, 8 males, 5 females: wing, males 124–140 (132), females 123–132 (131); tail, males 121–133 (124), females 117–130 (123); culmen, males 80–94 (88), females 63–85 (79).

A. d. duidae, 5 males, 5 females: wing, males 118–125 (121), females 114–122 (117); tail, males 111–119 (115), females 108–113 (110); culmen, males 73–78 (75), females 57–64 (61).

A. d. whitelyanus, 4 males, 4 females: wing, males 114–122 (118), females 111–121 (118); tail, males 100–114 (107), females 97–108 (104); culmen, males 67–77 (71), females 60–62 (61).

A. d. osgoodi, 1 male, 1 female: wing, male 114, female 115; tail, male 105, female 112; culmen, male 72, female 59.

The progressive modification of pattern found in the races of *derbianus* parallels the decrease in size. There is a tendency towards the reduction and, in some cases, elimination of certain colors in the races nearest the periphery of distribution. However, there seems to exist between the three eastern races an affinity which is not altogether shared by the western form. In size, the color of maxilla,

absence of a distinct blue nuchal patch and presence of a tinge of blue on the breast instead of about the margin of the white throat-patch, the former stand apart from the nominate race.

The salient features of the four races of *derbianus* are summarized in the following table:

	derbianus	*duidae*	*whitelyanus*	*osgoodi*
Size	large	intermediate	small	smallest (?)
Maxilla	dominantly black	black and reddish	black and reddish	black and reddish
Blue nuchal band	prominent	occasional trace	absent	absent
Blue malar mark	prominent	reduced	reduced	absent
Chestnut tips of rectrices	extensive	intermediate	reduced	absent

The following specimens have been examined:

A. d. derbianus.--26: ECUADOR (Sumarco Abajo, 3; Zamora, Loja, 2). PERU (Cayumba River, Huachipa, 1; Chanchamayo, Junín, 6; Cushi Libertad, Huanuco, 1; Huanuco, Huanuco, 2; La Oroya, Inambari, 1; Nuevo Loreto, 2; Pozujo, Huanuco, 1; Vitoe Garita del Sol, 1). BOLIVIA (Calabatea, La Paz, 2; Yungas, Cochabamba, 4). [Also reported from Archidona and Jima, Ecuador; Nairapi and Tilotila, Bolivia.]

A. d. duidae.--13 (including type): VENEZUELA (Mount Duida, Amazonas, 13).

A. d. whitelyanus.-13: VENEZUELA (Arabupu, Mount Roraima, Bolivar, 1; Mount Auyan-tepui, Bolivar, 2; Paulo, Mount Roraima, Bolivar, 1). BRITISH GUIANA (Mount Twek, 2; Quonga, 7). [Also reported from Merumé and Kanuku Mountains, British Guiana.]

A. d. osgoodi. 2 (including type): BRITISH GUIANA (Boundary Camp, Itabu Creek head, Acary Mountains, 2).

Piculus rubiginosus nigriceps subsp. nov.

Type from Boundary Camp, Itabu Creek head, Acary Mountains, British Guiana. Alt. 2,000 feet. No. 120168 Field Museum of Natural History. Adult male. Collected September 30, 1938, by Emmet R. Blake. Orig. No. 7413.

Diagnosis.—Nearest *Piculus rubiginosus guianae* Hellmayr in size, pattern of throat and color of under parts. Differs from all known races of *rubiginosus* in having the pileum blacker (less slaty-gray), the red of the nape reduced to an obscure, broken line bordering the pileum in the male (lacking in the female) and the

back and wing coverts clearer green, between Warbler Green and Pyrite Yellow.

Description of type. Crown and nape black, bordered with a very obscure, broken line of red. Back, rump, wing and tail coverts between Warbler Green and Pyrite Yellow. Remiges dark brown tinged with Orange-Citrine on the outer webs. Rectrices Olive-Green above (Pyrite Yellow below) becoming black towards the tips. Lores and sides of the head whitish and bounded below by a broad red malar streak. Chin and throat black, thickly spotted with white. Breast washed with pale greenish white and thickly striated, with relatively wide, brownish-black to olive-brown bars, both the ground color and the bars becoming, respectively, greener and more olive (less brown) on the flanks, thighs and under tail coverts. Abdomen Lemon Yellow and only obscurely barred. Under wing coverts and basal third of the inner webs of the remiges Maize Yellow. Under carpal coverts barred with olive-brown. Mandibles and tarsi blackish. Wing 119; tail 64; culmen 23.

Range. Known only from the type locality.

Remarks. The female is similar to the male but lacks the red malar streak. Average measurements of four females: wing 119; tail 66.5; culmen 23.

Lowland races of *rubiginosus* are known but the species is more characteristic of the Subtropical zone. The status of *nigriceps* is uncertain. However, the mountains of extreme southern British Guiana in which it was collected attain an altitude of approximately 4,000 feet and further explorations in that little-known region probably will establish the race as a resident of the higher mountains as well as of the adjacent lowland forests. This opinion is somewhat substantiated by the composite appearance of *nigriceps*. Its close relationship to both the isolated subtropical form *viridissimus* of Mount Auyan-tepui, Venezuela, and the more widely distributed *guianae* is suggested by an intensification of the green dorsal parts and reduction of the red nuchal band, characteristic of the former, combined with the larger size and less dark breast bars of the latter.

Dr. Chapman (Amer. Mus. Nov., **1051**, p. 8, 1939) has presented a brief review of the races of *rubiginosus* inhabiting Tobago, Trinidad, Venezuela, and British Guiana and combines the birds of Trinidad and northeastern Venezuela in a single race, *trinitatis*. This arrangement is untenable when specimens from both localities are compared with adequate series of related races. Individually and collectively the island birds are smaller than a series of six collected by the writer

in the subtropical forests of Mount Turumiquire, Venezuela. The latter are indistinguishable, both in size and color, from a series of *P. r. rubiginosus*, to which I now refer them. The nominate race appears, therefore, to be intermediate between *trinitatis* and the large eastern race *guianae*, but must be excluded from the spotted-throat *viridissimus-guianae-nigriceps* group of eastern Venezuela and British Guiana.

Dimensions of the five races are as follows:

P. r. trinitatis, 7 males, 7 females: wing, males 95.5 104.5 (99.5), females 93 102 (96.5); tail, males 47.5 60.5 (57), females 51–62 (56.5); culmen, males 21 23 (22), females 17 21 (20).

P. r. rubiginosus, 12 males, 9 females: wing, males 108 116 (111), females 109 118 (112); tail, males 61 67 (65), females 65 73 (68); culmen, males 20 24 (22), females 20 23 (21).

P. r. guianae, 8 males, 4 females: wing, males 114 123 (118.5), females 114 119 (116); tail, males 68 76 (71.5), females 65 71 (67); culmen, males 23 26 (24.5), females 23 24 (23.5).

P. r. viridissimus, 2 males, 4 females: wing, males 113 118 (115.5), females 115–119 (117.5); tail, males 65 67 (66), females 70–72 (71); culmen, males 26, females 21 25 (23).

P. r. nigriceps, 3 males, 4 females: wing, males 119 121 (120), females 116-122 (119); tail, males 64 70 (67), females 65-72 (66.5); culmen, males 23, females 23.

The following specimens have been examined:

P. r. trinitatis. 14 (including type): TRINIDAD (Princestown, 2; Caparo, 10; unspecified, 2).

P. r. rubiginosus. 21: VENEZUELA (Cerro del Avila, Federal District, 2; Cocollar, Sucre, 1; Cumbre de Valencia, 2; El Guacharo, 1; La Trinidad, Sucre, 2; Los Palmales, 4; Macuto, Federal District, 1; Mount Turumiquire, Sucre, 5; Quebrada Secca, 1; San Antonio, Sucre, 2).

P. r. guianae.- 12: BRITISH GUIANA (Carimang River, 1; Kartabo, 1; Rockstone, 1). VENEZUELA (Arabupu, Mount Roraima, Bolivar, 3; Mount Duida, Amazonas, 6).

P. r. viridissimus.– 6 (including type): VENEZUELA (Mount Auyan-tepui, Bolivar, 6).

P. r. nigriceps.—7 (including type): BRITISH GUIANA (Boundary Camp, Itabu Creek head, Acary Mountains, 7).

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THE HERPETOLOGICAL FAUNA OF THE SALAMA BASIN, BAJA VERAPAZ, GUATEMALA

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Although the plateau of Guatemala, the Pacific coast, and the mountains of Alta Verapaz have received considerable attention from herpetologists both in the past and again more recently, the arid interior basins and the desert of the upper Motagua River valley have remained almost untouched. This is surprising when one considers the fact that here lies a large area of tropical desert hemmed in on all sides by cloud forests, high plateaus, and tropical rain forests, and constituting, as it does, a biotic province of considerable extent and importance. Stejneger's description of *Ctenosaura palearis* (1899, p. 381) from Gualán in the Motagua Valley has long afforded a suggestion of distinctive faunal elements in this region.

Recently both authors have visited these areas and have been fortunate enough to secure two small collections from the Salamá Basin, one of the largest of the chain of interior desert basins lying north of the Motagua River. Although these collections are not rich with respect to either species or individuals, they are of considerable importance when viewed in the light of our lack of information on those regions, and the following report is presented as a study of a special area, probably typical of the isolated desert basins extending from San Gerónimo in Baja Verapaz westward to Sacapulas in El Quiché. The first collection was assembled by Mr. Emmet R. Blake in April, 1934, when he visited Salamá as a member of the Mandel Guatemalan Expedition of Field Museum of Natural History under the direction of the senior author, and the second was made in July, 1938, by the junior author when he was carrying on investigations under

the auspices of the Museum of Zoology of the University of Michigan and the Carnegie Institution of Washington.

The Salamá Basin is only one of a series of basins which, though separated from each other, are identical in structure, climate, and, superficially at least, in flora and fauna. The junior author has visited briefly those in which Salamá, Rabinal, and Chicaj (San Miguel) lie, though collections were made only in the first, and except for size, the first named being by far the largest, could see no appreciable differences in them. The Salamá Basin has been formed by the Salamá River and its tributaries, which have cut back into the schists which form a high east-west ridge north of the Motagua River. This ridge is known, to the east of Salamá, as the Sierra de las Minas and, to the west, as the Sierra de Chaucus. The valley itself has an east-west trend, sloping towards the west, and is approximately ten kilometers long and not more than four or five kilometers wide. The valley floor has an elevation of about 900 meters at Salamá and is about 100 meters higher at San Gerónimo. Surrounding this valley on the east, west, and south are the schist ridges mentioned above that rise 500–700 meters above the valley floor, while the north side of the valley is walled off by a ridge of serpentine of approximately the same height, through which the Salamá River has cut. The valley floor presents a gently undulating surface covered with quaternary alluvium ranging from sand to coarse gravel and talus. The surrounding mountain slopes are either barren rock outcrops or are covered at most with a thin mantle of gravel and are cut by numerous arroyos which join to form the Salamá River.

The climate is distinctly arid, contrasting greatly with the humid forest of Alta Verapaz directly to the north. At Salamá over a period of seven years the average annual rainfall is given by Sapper (1932, Tab. 1) as 764 mm. The driest months are January and February during which no rain falls, and the wettest are June and October with 233 mm. and 92 mm. of precipitation, respectively. The average annual temperature is 22.6° C., May being the hottest month with a temperature of 25.3° C. and January the coldest with 19.9° C. During the junior author's stay at San Gerónimo, July 5–10, 1938, the highest temperature recorded was 28° C. and the lowest 17° C. During the same period, afternoon and night rains of considerable intensity but of short duration were recorded on four of the six days. Precipitation was sufficient to form many temporary pools on the valley flats in which great numbers of amphibians were found breeding.

FIG. 21. The Salamá Basin from above San Geronimo, looking northwest.

FIG. 22. The more arid northwestern end of the Salamá Basin, below Salamá.

The vegetation of the valley floor has been considerably altered owing to cultivation, especially in the vicinity of San Gerónimo, where cane is grown in considerable quantities. Corn, cultivated on the *milpa* plan, is also extensively grown throughout the valley. In the areas of poorer soils where the vegetation is probably more or less virgin, short grass predominates, while cactus of the prickly-pear variety is common, and low scrubby bushes and the *nance* tree are all indications of aridity. Roads are lined with larger species of cacti and these are often used to form cultivated fences around dwellings. The lower mountain slopes are also well cultivated or covered with dense second growth. At higher altitudes, pine predominates, usually mixed with oak. The mountain slopes to the northeast, where the Salamá River rises, are covered with nearly pure stands of oak. On the highest part of the southern ridge, cloud forest conditions prevail, and the trees, though still oak and pine, are hung with moss and covered with epiphytic plants.

Birds and insects in the Salamá Basin have been the chief aim of the several naturalists who have studied it. San Gerónimo was a famous collecting locality of Champion and his patron Salvin. Later Owen and Hague sent collections to both England and the United States from that region. As a result we are not wholly in the dark as to the faunal affinities of this entire interior desert region. Godman (1915, p. 47) believes that they must be treated either as a division of the Guatemalan highland or must be considered as a separate faunal entity. More recently Griscom (1932, pp. 35-36) believes they represent merely a subdivision of a Central American Arid Zone, in which he may be correct, granting his premises. But in so far as Guatemala is concerned, these interior deserts constitute a faunal province of major importance. The nearest corresponding area to the east is at Comayagua, Honduras.

Our present knowledge seems to indicate that Guatemala, herpetologically at least, is made up of seven biotic provinces: the Pacific coastal area, the Pacific escarpment with its associated volcanoes, the plateau and its non-volcanic ridges, the karst mountains of Alta Verapaz, the Sierra de los Cuchumatanes, the Petén and Lake Yzabal lowlands, and the central desert region.[1] This latter will, largely on the basis of presence and absence of certain forms owing to altitude, undoubtedly have to be subdivided into two

[1] The Sierra de las Minas and the Sierra de Merendon are too poorly known to be placed in this biogeographic scheme. It is suggested that while they may demark provincial boundaries, their extensive cloud forests may constitute additional biotic provinces.

separate subprovinces, namely, the upper Motagua Valley (here referred to as the "Zacapa Desert") and the interior desert basins. Certainly it will not fit into Godman's scheme, for such common plateau items as the numerous salamanders, *Bufo bocourti* Brocchi, *Anolis uniformis* Cope, *Sceloporus formosus smaragdinus* Bocourt, and *Trimeresurus godmani* Gunther are lacking in this area, while the seasonally arid Pacific coast and the escarpment above it, if the senior author's earlier deductions are correct (Schmidt, 1936, pp. 138 146), represent two quite different faunas, and the humid mountains of Alta Verapaz and the Petén and Caribbean lowlands have, of course, a totally different assemblage. Moreover, the collections before us have revealed two species which are known only from specimens secured in this region. They are *Hypopachus championi* Stuart and *Gymnophthalmus birdi* Stuart. Until further material is forthcoming from many of the biologically unexplored regions of Guatemala, it seems futile to extend this discussion.

The following is a list of the species which are recorded from the Salamá Basin:

Bufo microtis Werner
Bufo marinus Linnaeus
Hyla baudinii Duméril and Bibron
Hyla staufferi Cope
Eleutherodactylus rugulosus Cope
Rana macroglossa Brocchi
Rana pipiens Schreber
Hypopachus championi Stuart
**Phyllodactylus tuberculosus* Wiegmann
Basiliscus vittatus Wiegmann
Sceloporus lunaei Bocourt
Sceloporus variabilis olloporus Smith
Ameiva undulata Wiegmann
Cnemidophorus deppii deppii Wiegmann
Cnemidophorus sackii Wiegmann
Gymnophthalmus birdi Stuart
**Thamnophis scalaris* Cope
**Storeria dekayi* Holbrook
**Masticophis mentovarius* Duméril and Bibron
**Drymarchon corais melanurus* Duméril and Bibron
**Lampropeltis triangulum polyzona* Cope
**Xenodon rhabdocephala* Wied
Stenorhina degenhardtii Berthold
Leptodeira rhombifera Gunther

* An asterisk indicates that we have not seen this species from the Salamá Basin. The species so marked have, however, been recorded by Gunther (1885–1902).

To this may be added *Gerrhonotus moreletii* Bocourt, *Leptophis modestus* Gunther, and *Geophis chalybaeus* (Wagler), which Günther (loc. cit.) reports from the Cubulco Basin to the west.

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Bufo marinus Linnaeus

San Gerónimo, UMMZ 84084 (4), 84085.

Abundant throughout the basin and occurring in very great numbers within San Gerónimo.

Bufo microtis Werner

San Gerónimo, UMMZ 84083.

Both *Bufo marinus* and the specimen which we are tentatively referring to *B. microtis* were common along ditches and on the desert flats near San Gerónimo in the evenings, especially following rains. Unfortunately, the junior author assumed the species to be *Bufo valliceps* and collected but a single specimen as a record. An examination of this specimen reveals that it lacks the lateral row of tubercles so characteristic of *valliceps*, has a comparatively smaller tympanum, and possesses extremely prominent crests. An emaciated specimen from Morazán (in the "Zacapa Desert" region) collected by the senior author shows these same characteristics. Since Werner (1896, p. 350) described *Bufo valliceps* var. *microtis* as lacking the row of lateral tubercles and having a relatively small tympanum, we are referring the above specimens to that name and according it specific rank.

Werner's specimen originated in Honduras where areas remarkably similar to the one under discussion are known to occur. That a form of *Bufo* other than *valliceps* occurs in the more arid portions of Central America is very probable. In collecting in various parts of Guatemala the junior author has noted in a number of instances that any local pocket which approaches arid conditions lacks *Bufo valliceps*. This was found to be true in the region of Sacapulas on the upper Río Negro, at La Primavera in a savanna country in the gorge of the Río Negro just north of the Salamá Basin, and in the local savannas near Cahabón in Alta Verapaz.

In any case the interpretation of *microtis* as a Central American subspecies of *valliceps* is untenable.

Hyla baudinii Duméril and Bibron

San Gerónimo, UMMZ 84076 (16).

This variable and widespread species was found in great abundance, breeding in temporary pools in the *potreros* to the south of San Gerónimo on the nights of July 6 and 8, 1938, following heavy afternoon rains. *Hypopachus championi* occurred in great numbers in the same pools.

Hyla staufferi Cope

San Gerónimo, UMMZ 84077 (7), 84078 (14).

Our series of 21 specimens agree well, in all characters, with material from Tamaulipas, Oaxaca, Campeche, and El Petén, and we concur with Smith (1938, pp. 9 10) in relegating *Hyla culex* Dunn and Emlen to the synonymy of this species. Unlike *Hyla baudinii* and *Hypopachus championi*, which were found breeding in temporary pools, *Hyla staufferi* was not collected in the water, but preferred to sing from the branches of the small acacia-like shrubs bordering the pools.

Eleutherodactylus rugulosus Cope

Salamá, FMNH 20670 (9).

The above specimens, except that they are not particularly rugose above, agree well with Kellogg's description (1932, pp. 116–117), and with University of Michigan material from Nicaragua. Specimens from the latter country have been compared with specimens in the collections of the United States National Museum and have been discussed in a previous paper (Gaige, Hartweg, and Stuart, 1937, pp. 5–6).

Rana macroglossa Brocchi

San Gerónimo, UMMZ 84073 84074, 84075 (6).

Kellogg (1932, pp. 203, 206 207) considers both *Rana macroglossa* and *Rana maculata* of Brocchi (1877, pp. 177-178) synonyms of *Rana pipiens* Schreber, though he questions the identity of one of the cotypes of the former. Günther (1900, pp. 198, 201–202) accepted *Rana maculata* as valid but gave no opinion as to the status of *Rana macroglossa* beyond pointing out that Brocchi's second description does not agree with his figures (1882, pp. 12 -13, pl. 3, figs. 1 2). Brocchi's descriptions of the two are poor, in that only two diagnostic characters are presented to distinguish between the two species, namely, the size of the tongue and the arrangement of the vomerine teeth. For this reason it is difficult to decide which of Brocchi's names is applicable to the series at hand, for, as will be shown later, they possess characters in common with each of Brocchi's forms. One thing is certain—they are not to be confused with *Rana pipiens*. At Finca Samac, just west of Cobán, Alta Verapaz, both *pipiens* and specimens like the above were found living together along a small stream.

They may readily be distinguished from *pipiens* by the following characters: (1) More extensive webbing of the feet; (2) absence of

glandular, dorsal tuberosities between the lateral folds; (3) difference in dorsal pattern; and (4) smaller tympanum. Inasmuch as the identity of these specimens is questionable, it seems worthwhile to present a full description of them.

Head elongate with a moderately slender snout, 70 80 per cent as long as broad. Tympanum about one-half the diameter of the eye, though occasionally slightly larger; diameter of the eye greater than the distance from the eye to the nostril. The nasal region oblique, the canthus rostralis rounded, and the loreal region considerably depressed. The tongue is large and rounded with moderately large cornua and is slightly indented on its anterior margin. Vomerine teeth in two rounded or slightly oblique series between the choanae. The first finger is decidedly longer than the second and is swollen at the base. The extended hind leg reaches to a point between the eye and the end of the snout. The webbing on the feet is broad and extends about one-half the distance up the antepenultimate phalange of the fourth toe, and continues as a narrow fringe to the last phalange. The palmate tubercles are only slightly developed, and the tubercle at the base of the fourth toe is feeble.

The skin of the back and the upper surface of the legs is pustular. Dorsally, the ground color of the head and back is olive-green in life and greenish gray in spirits. On the back are numerous, irregular, dark spots which become fainter anteriorly and often completely disappear on the head. A distinct, white, pineal spot is present at the level of the anterior margin of the eyes. Laterally the head shows a distinct, black line extending from the tip of the snout, through the nostril and eye, and curved around and behind the tympanum, which is light brown. A conspicuous white glandular line extends obliquely from the tip of the snout posteriorly below the eye, and across the angle of the mouth to the level of the arm insertions. The upper and lower lips are gray, marbled with white. The dorsolateral folds are white or gray and extend from the posterior margin of the eye almost to the anus. These folds are bordered above and below by a diffused dark line. The flanks are light gray (in spirits) and are generally lightly spotted with irregular dark dots with a few white punctations.

The upper surfaces of the arms are brownish gray, the upper arm slightly spotted with dark and the lower arm generally banded with black on their anterior faces. A conspicuous black bar is present on the under side of the shoulder. The legs are brownish gray, barred and spotted with black or gray above and marbled with darker

shades on their posterior surfaces. Beneath, all are light yellow (in life; white in spirits), either immaculate or with scattered brownish gray spots on the throat.

The maximum head-body length of these specimens is 46 mm. and the minimum 34 mm. Mrs. Helen T. Gaige of the University of Michigan Museum of Zoology has called our attention to the fact that they may not be fully adult. In comparing these specimens with the small lot from Finca Samac, several discrepancies are noted. These latter have smoother skin on the back and legs, a relatively narrower tongue, heavy brown stippling on the throat and chest in the males, and the lateral, glandular, white stripe on the head does not extend forward onto the snout. The darkened throat and chest are obviously a character of adult males, and Mrs. Gaige has suggested that in these the lateral white stripe on the head may be obscured during breeding activities. The pustulose condition of the skin in the San Gerónimo specimens may be a response to the arid conditions of the region as compared with the humid forests of the Cobán area.

In referring the above specimens to *macroglossa* we have been guided by several facts. In structural characters (arrangement of teeth, size of tongue, etc.), with the exception of the pustular skin, they approximate the description of *macroglossa*, while they deviate from that of *maculata*, which was described as having an angular canthus, obliquely arranged vomerine teeth, first and second fingers of about equal length, and less extensive webbing on the feet. In pattern they fit both descriptions fairly well, though Brocchi makes a special point of the glandular light stripe on the side of the head in *macroglossa*. The type localities are of no aid, *maculata* originating from the plateau of Guatemala (Totonicapam) and *macroglossa* being labeled merely "Guatemala." It is entirely possible that a comparison of the types with a large series from various localities may indicate that the two are synonymous. At the present, however, their status is uncertain, and it is only provisionally that we refer these specimens to *macroglossa*.

This species was most commonly observed at night in temporary pools in the *potreros* on the valley flats, though several specimens were taken in pools in the beds of arroyos on the mountain slopes.

Rana pipiens Schreber

Salamá, FMNH 20671 20672.

Although *Rana macroglossa* was taken from temporary pools on the valley flats and from arroyo pools in the mountains, this form

was seen at San Gerónimo only in very boggy spots along the small valley streams south of the town, where it was impossible to secure them. The above two specimens are from Salamá. We employ the name *pipiens* with reservation, since some geographic division of this form may prove recognizable with further study.

Hypopachus championi Stuart

San Gerónimo, UMMZ 84079 (42), 84080 (23), 84081 (11), 84082 (36), 85533 (type series), FMNH 31636-31639 (type series).

This recently described form has been fully discussed in the original description (Stuart, 1940, pp. 19 21). In early July it was abundant in temporary pools on the desert flats west of San Gerónimo, but the almost complete absence of females indicates that it had just emerged for breeding activities.

Basiliscus vittatus Wiegmann

San Gerónimo, UMMZ 84071-84072.

This lizard, common throughout Central America, occurred only sparingly at San Gerónimo, where it was observed only along the small streams in the valley flats.

Sceloporus lunaei Bocourt

Salamá, FMNH 20674–75; San Gerónimo, UMMZ 84064 (2), 84065, 84066 (3), 84067 (18), 84068 (3), 84069–84070.

The most common lizard in the region. At San Gerónimo it was very abundant in the valley, where it was found on the trees and stone walls along roads. It was met with occasionally on the lower mountain slopes, but in the oak-pine zone it is apparently replaced by *Sceloporus variabilis olloporus* Smith.

Sceloporus variabilis olloporus Smith

San Gerónimo, UMMZ 84061 (3), 84062 (4), 84063.

All the above are apparently typical and check well with the type description (Smith, 1937, pp. 11-13). The form is strictly saxicolous and never occurs on the valley floor. It seems to prefer large boulders in the dry arroyos of the oak-pine zone on the mountain slopes where it is met with only sparingly. *Sceloporus lunaei* replaces it on the valley flats.

Ameiva undulata Wiegmann

San Gerónimo, UMMZ 84048–84051.

In a recent paper Smith (1940, pp. 55–56) has initiated the recognition of certain geographic variants of the *undulata* group of

Ameiva, and somewhat earlier Hartweg and Oliver (1937, pp. 7-8) commented on the confusion existing within the group. To date, we have four subspecies of *undulata* named. These are typical *undulata*, ranging from Tehuantepec northward along the Mexican west coast, *parva*, which the junior author formerly misapplied to the Yucatán-El Petén form (1934, p. 11), ranging along the Pacific coast from Tehuantepec well into Guatemala, *hartwegi*, the form of Yucatan and El Petén, and *stuarti*, the common Veracruz and Tabasco race. Smith, though apparently misunderstanding the comment of Hartweg and Oliver, restricts typical *undulata* to the Tehuantepec form. It is unfortunate that Smith chose specimens from eastern Chiapas for his types of the last two races, for data available to us indicate that there is a broad region of intergradation between *stuarti* and *hartwegi* in that region. He has nevertheless selected specimens distinctly representative of the two races to serve as types. Though these four races are difficult to define, anyone familiar with *undulata* can hardly fail to recognize their validity.

Very recently Dunn (1940, pp. 114 115) notes that there is in southern Central America another form of the *undulata* group, *leptophrys* of Cope, and indicates that between Costa Rica and Guatemala other races are to be expected. Undoubtedly the next form above *leptophrys* will prove to be *pulchra* Hallowell from Nicaragua, specimens of which Barbour and Noble (1915, p. 475) have referred to *Ameiva undulata quadrilineata* Hallowell. From Honduras the junior author has also seen material, which if not the same, is certainly very close to *pulchra*.

The specimens which we have before us come from San Gerónimo and appear to be very similar to Honduran specimens. It is not improbable, therefore, that when all the material is assembled, the Zacapa Desert and interior basins form may warrant a subspecific name, but, lacking sufficient material, we hesitate to take this step. The specimens are also close to *parva* of the west coast and differ primarily in the greater number of vertical light bars on the sides.

This form occupies about the same habitat as *Cnemidophorus sackii* Wiegmann, but is less abundant. It is most frequently met with in the oak-pine zone on the lower mountain slopes and among the scrubby second-growth on the valley floor.

Cnemidophorus deppii deppii Wiegmann

Salamá, FMNH 20673.

Our single adult specimen is extremely pale beneath and is quite similar to Tehuantepec material which has been discussed by Hart-

weg and Oliver (op. cit., pp. 1 3). It is lineate laterally, with no trace of bars or mottlings.

Cnemidophorus sackii Wiegmann

Salamá, FMNH 20677 (8); San Gerónimo, UMMZ 84052 (1), 84053, 84054 (2), 84055 (7), 84056 (3).

In assigning the above specimens to *sackii*, we concur with Taylor (1938, pp. 520–523), though we are by no means in accord with Burt (1931, pp. 97–121) that *sackii* (=*gularis*) can not be broken down into geographic races. While it is granted that many of the variable characters studied by Burt show no geographical correlation, an examination of material in the University of Michigan Museum of Zoology clearly indicates that certain features dismissed by Burt as "trivial" (op. cit., p. 102) require more critical consideration.

Taylor (loc. cit.) and more recently Smith (1938, p. 4) have suggested that populations from Sinaloa and Yucatan respectively show a tendency towards subspecific variation. Our data, while not conclusive, indicate that a number of races of *sackii* exist, and certainly, in the face of a complete absence of experimental data, we do not take seriously Burt's statement (op. cit., p. 101) that certain variations are purely a response to environmental conditions.

The above specimens are wholly unlike anything we have seen. Dorsally, the specimens are olive to olive-brown, somewhat lighter in the mid-dorsal region. Adults show no evidence of a striped pattern, but are irregularly punctated above and laterally with small, rounded yellow spots over the posterior two-thirds of the body, leaving the neck and shoulders without pattern. Laterally there is some slight evidence of the presence of the typical, ventral-most light stripe owing to a slight elongation of the light spots. The upper surfaces of the legs are likewise punctated with light spots. In a few specimens there is a tendency for some of the spots in the ventrolateral region to elongate vertically to produce broken, vertical bars. In general, however, the specimens show a predominant pattern of sparsely scattered light spots on a darker background. The ventrum is dark blue over the posterior two-thirds of the body, leaving the chest, throat, and chin immaculate or nearly so. The postantebrachials are very small and only slightly larger than the surrounding granules, and the femoral pores vary from 17 to 22 with a mean of about 20.

In half-grown specimens the typical striped pattern is present, but this gives way to the spotted condition in specimens over 85

mm. in body length (our largest measures over 140 mm.). On the basis of the striped juvenile pattern, Burt (loc. cit.) emphasizes over and over again the conspecificity of all populations of *sackii*. This seems to us utterly ridiculous, as it is well known that the young of many species of animals of diverse groups exhibit very similar patterns, whereas the adults are quite different.

The closest approach to the above specimens is to be found in a population from San Luis Potosi, Mexico. But in these latter the postantebrachials are enlarged, and they possess a very dark chest and a light belly. Specimens from Colima, Mexico, are also spotted and, like those from Baja Verapaz, have an immaculate chest, but they are easily distinguished from our material by their enlarged postantebrachials and by the fact that the dorsal spots are larger and more numerous, and tend to arrange themselves in longitudinal series. The character of the postantebrachials presents a variation of rather interesting geographic variation. In our material from the southern part of the range, Honduras, Guatemala, Campeche, and Yucatan, the postantebrachials are very small and often granular, while in northern specimens they are greatly enlarged.

With regard to the application of a proper name to the specimens before us, any name other than *sackii* would lead to still greater confusion in this complex group. It seems best, for the present, to await a reassembling of all available material and a more critical examination of the various combinations of characters than that presented by Burt. The Salamá Basin population, which is probably typical of all the arid basins of central Guatemala, will probably prove to be distinct from any of the described races.

At San Gerónimo the junior author found this species in considerable numbers in the oak-pine zone on the lower mountain slopes and in the dryer parts of the valley among the scrubby vegetation.

Gymnophthalmus birdi Stuart

San Gerónimo, UMMZ 84057 (type), 84058-84060 (paratypes).

As noted in the original description (Stuart, 1939, p. 3) this little scinc-like teiid was found on the valley flats in the loose earth in holes left by stumps which had been pulled by an Indian.

Stenorhina degenhardtii Berthold

Salamá, FMNH 20666; San Gerónimo, UMMZ 84047.

Both specimens are males of the banded variety, with one middorsal and a pair of lateral bands on each side. In the Field Museum

specimen these dark lines are visible only anteriorly. The specimen in the Museum of Zoology has postnasals and loreals fused, while these scutes are distinct in the Field Museum specimen; the ventrals and caudals are 162 and 34 and 161 and 41 respectively. The specimen in the Museum of Zoology was found near a small temporary pond in a *potrero*.

Leptodeira rhombifera Günther

Salamá, FMNH 20664-5.

These two specimens from Salamá, not far east of the type locality, Cubulco, agree well with the original description except that each has about ten more dorsal rhombs on the body. The male specimen, No. 20664, has ventrals 162 and caudals 84. The female, No. 20665, has ventrals 163, tail broken. The dorsal scale formula in both is 21-23-21-19-17.

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ZOOLOGICAL SERIES

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COPULATORY ADJUSTMENT IN SNAKES

By Clifford H. Pope

Curator of Reptiles and Amphibians

The reproductive habits of snakes, though long neglected, are at last receiving considerable attention from a variety of angles. Sex recognition, courtship patterns, and viability of the sperm have been investigated recently with surprising results.

The literature is, however, silent on one aspect of reproduction, namely, the actual position of the hemipenis in the cloaca during copulation. Just how is the seminal fluid conducted to the oviducts? The older literature, Boulenger's "Snakes of Europe" (1913), for example, states that one hemipenis is pressed against the other so that the two sulci form a canal through which the semen is conducted "into the oviduct." Such a statement is obviously erroneous, since recent observations, as cited in two excellent summaries of snake courtship (Davis, 1936; Noble, 1937), prove that only one hemipenis is used at a time. Therefore, the sulcus of one organ must alone convey the semen.

This separate use of the hemipenes is fully confirmed by a pair of colubrid snakes (*Liophis poecilogyrus* Wied, F.M.N.H. Nos. 35697–8 from Bolivia) killed while copulating and preserved without dislodging the hemipenis. Dissection shows that each branch of the sulcus ends in a lip surrounded by a ridge which is firmly pressed against an area of the cloaca, in the center of which an oviduct opens. Thus each sulcus makes a direct connection with an oviduct, as shown in the accompanying figure. Moreover, the numerous hemipenial spines grip the cloacal walls so firmly that no shifting is possible. The turgid male organ greatly distends the cloaca, as also noted by Noble (op. cit., p. 677) and others in various species of snakes during copulation.

Hans Beuchelt's study of penial erection in the aquatic European colubrid snake, *Natrix natrix*, led him to conclude that the organ is inserted in a half-tumescent condition and that full and complete evagination is accomplished only after the basal spines have become

anchored. Obviously, then, these spines serve a dual purpose: they keep the hemipenis from being pulled out and they hold the basal part firmly in place as a support for the distal section, which in turn can, quite independently of the male's movements, attain its ultimate position. The independent adjustment and firm grip must be of considerable advantage, since the male often loses his position and is dragged along by the female (Noble, op. cit., p. 678, etc.).

One unfamiliar with snake genitalia might conclude that this observation on *Liophis poecilogyrus* virtually closes the problem of hemipenial adjustment, whereas actually the problem is barely opened, for the hemipenes in snakes vary greatly in structure. They may be simple, with either a divided or an undivided sulcus; or shallowly bifid, as in *L. poecilogyrus;* or deeply bifid, as in the king cobra (*Hamadryas hannah*). The bifid section in this cobra is seven times as long as the simple one. Many other types are known and each one must have its own special adjustment.

There is, moreover, close correlation between penial and cloacal structure. Cope (1900, p. 700) states that the vaginal part of the cloaca may be deeply bilobate. Apparently, he did not connect this condition with bifid hemipenes, since he wrote: "It [the hemipenis] enters the vagina of the female and its extremity occupies the corresponding anterior lobe of the latter." In the few species that I have dissected, the cloaca is bilobed and the hemipenis bifid to about the same extent. It is reasonable to conclude that each branch of the male organ fits into a lobe of the cloaca. *Liophis poecilogyrus* illustrates an intermediate condition in which the hemipenis is only slightly bifid and the cloaca shallowly bilobate. Distortion by the turgid hemipenis has obscured the latter condition in the female figured.

Cope (loc. cit.) also noted that when the hemipenis is spiny the cloacal walls are thick, but when the male organ is unarmed the cloaca is thin-walled. I have been able to confirm this point nicely in two species of Asiatic pit-vipers, *Trimeresurus albolabris* Gray and *T. stejnegeri* Schmidt, known to be astonishingly alike in color and all other external characters. They were, in fact, long considered identical and the females cannot yet be distinguished by external characters alone. In 1933 my wife and I demonstrated that the two species could be recognized by their strikingly different hemipenes, that of the former being long, slender, devoid of spines and deeply bifid, whereas that of the latter is shorter, thicker, not as deeply forked, and spinous. Dissection of a female of the former

(F.M.N.H. No. 6711) shows that the cloaca is long, deeply bilobed, and thin-walled. In contrast to this a specimen of the latter (F.M.N.H. No. 25201) has a shorter cloaca with shorter lobes and thick walls. The correlation is obvious enough.

The question at once arises whether such a marked difference in penial structure is an efficient isolating mechanism making cross-breeding of these two strikingly similar species physically impossible.

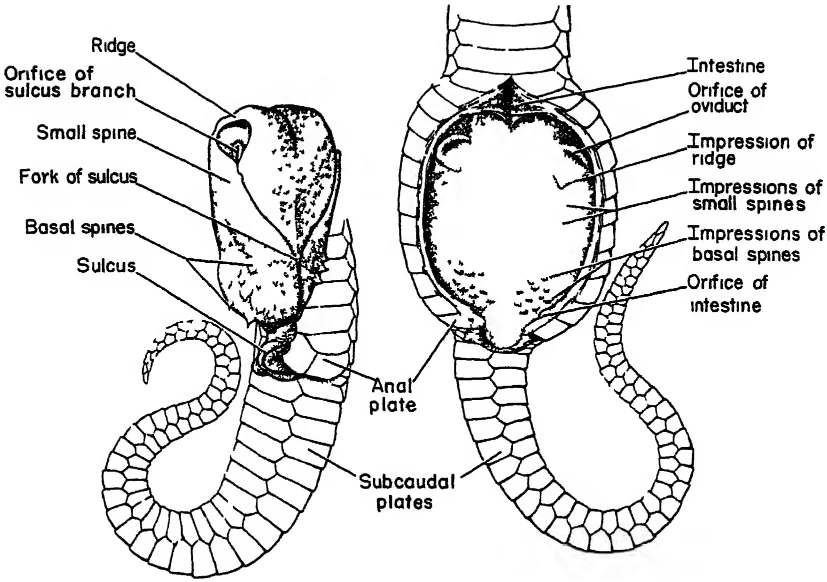

FIG. 23. Anal region of a male (left) and of a female of the colubrid snake *Liophis poecilogyrus* seen from below. The ventral body wall of the female has been bisected and its halves spread apart to expose the interior of the cloaca, from which the turgid hemipenis was removed. The exposed side of the latter lay against the dorsal wall of the cloaca so that each sulcus spermaticus opened at the orifice of an oviduct. × 3. Drawing by H. Elizabeth Story.

The long spines of *T. stejnegeri* would probably do considerable damage to the delicate walls of the *T. albolabris* cloaca. Moreover, the differences in form and proportion of the two organs would present other difficulties. Noble (op. cit.) has summarized the few authentic cases of cross-mating in snakes, but too few details are known about them to permit the drawing of conclusions as to the frequency of their occurrence in nature or its results under any conditions. Very careful experiments would have to be devised to investigate this matter, since evidence that sperm remain viable

in females for months if not years is rapidly accumulating (see Rahn, 1940, and Haines, 1940, and their bibliographies).

SUMMARY

During copulation the raised terminal lip of each branch of the bifid sulcus spermaticus in a colubrid snake, *Liophis poecilogyrus*, fits snugly against the orifice of an oviduct. It is reasonable to conclude that a similar adjustment occurs in other snakes with divided sulci.

Close correlation between penial and cloacal structure occurs in two Asiatic pit-vipers and a South American colubrid snake. Such a correlation is probably of common occurrence among snakes.

It is suggested that penial structure may be an important isolating mechanism in certain snakes. Therefore, penial adjustment is a subject worthy of further investigation because of its bearing on the important problem of speciation.

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ZOOLOGICAL SERIES

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A NEW SUBSPECIES OF SCELOPORUS JARROVII FROM MEXICO

BY HOBART M. SMITH[1]

AND

BRYCE C. BROWN

In late fall (November 15) of 1938, the senior author and his wife collected a large series of a striking black-and-orange *Sceloporus*, immediately recognized as a form different from any described species, on the vertical, rock slopes of a road-cut on Mount Zapalinamé, near Saltillo, Coahuila. All were found near the top of Diamond Pass, at about 7,800 feet elevation, where they were extremely abundant and associated with *S. m. disparilis* and *S. poinsettii*. At lower elevations on the same mountain they were not seen, although apparently suitable rock cliffs are available. The form does occur at lower elevations, however, for two were found on eroded cliffs near Arteaga (some nine miles southeast of Saltillo), but little above the elevation of the plains.

Prior to this date, the junior author had encountered the same form, also at Diamond Pass, on April 30, 1937. Three adults were then secured and were kept alive for about three months. On December 25, 1940, the mountain was again visited. There was a thin layer of snow on the ground near the top of the pass, covering the peaks of the mountain. It was very cold and a strong wind was blowing, but in spite of this a number of half-grown and juvenile lizards were seen sunning themselves in protected places, about three hundred feet from the snow line. No adults were seen at that time.

Sceloporus jarrovii oberon subsp. nov.

Type from Arteaga, Coahuila. No. 105823 United States National Museum. Male. Collected November 15, 1938, by Hobart M. and Rozella Smith.

Paratypes.—One hundred and seventy-four; one, F.M.N.H. No. 37772, from the type locality; all the remainder from Diamond

[1] Walter Rathbone Bacon Scholar, Smithsonian Institution.

Pass, 7,800 feet, Mount Zapalinamé, near Saltillo, Coahuila (U.S.N.M. Nos. 105606–107744; F.M.N.H. Nos. 37753–71; E. H. Taylor–H. M. Smith Nos. 26916–39; B. C. Brown Nos. 52–54, 99–105).

Diagnosis.—Supraoculars essentially in two rows; median lateral body scales subequal to mid-dorsal scales in size; adult males nearly entirely black above and below, with spots of orange on sides of head, belly and tail; light borders of nuchal collar very poorly defined in specimens of all ages and in both sexes, almost or quite obsolete in adult males; throat orange or pale blue, sides of belly pale blue or orange in males, becoming orange in large specimens.

Description of type.—Interparietal three times as large as a parietal; one frontoparietal on each side, separated medially by a small azygous scale; frontal transversely divided, anterior section nearly twice as large as posterior; two prefrontals, in contact medially; three frontonasals, the median transversely divided (abnormal); internasals irregular, separated from rostral by two scales; a subnasal; two canthals; a very elongate loreal; preoculars 1–2; one subocular; two postoculars; two rows of lorilabials, reduced to one below orbit; outer row of labiomentals not reaching mental; gular scales smooth, with a single apical notch.

Temporal scales keeled, strongly mucronate; three large auricular lobules, upper largest, rounded; scales between ear and lateral gular pouch subequal in size to posterior temporal scales, keeled, very strongly mucronate, denticulate; these scales in turn subequal in size to scales between gular pouch and insertion of foreleg; latter weakly keeled and flatter than scales about ear, but strongly mucronate and denticulate; the median scales in all these areas little smaller than corresponding mid-dorsal scales.

Dorsals very feebly keeled, not or very weakly mucronate, with numerous lateral denticulations and notches, especially in nuchal region; lateral body scales subequal to or somewhat larger than dorsal scales, about three times as large as median ventral scales; 38 dorsals; 40 scales around middle of body.

All scales on foreleg except ventrals and those on anterior surface of lower foreleg keeled; dorsals on upper foreleg larger than those on lower foreleg, a little smaller than mid-dorsals on body; dorsal scales on foreleg strongly mucronate, especially toward insertion of limb.

Dorsal scales of hind leg strongly keeled, strongly mucronate, those on shank very little larger than those on thigh, subequal to median dorsals on body; scales on ventral surface of hind leg smooth, rounded on shank, notched on thigh; scales on posterior surface of

thigh very strongly mucronate; median scales a little larger than median preanal scales; femoral pores 15–16; postanals enlarged, subcaudals perfectly smooth, except toward tip of tail; scales at base of tail (dorsally) rather strongly mucronate, feebly denticulate,

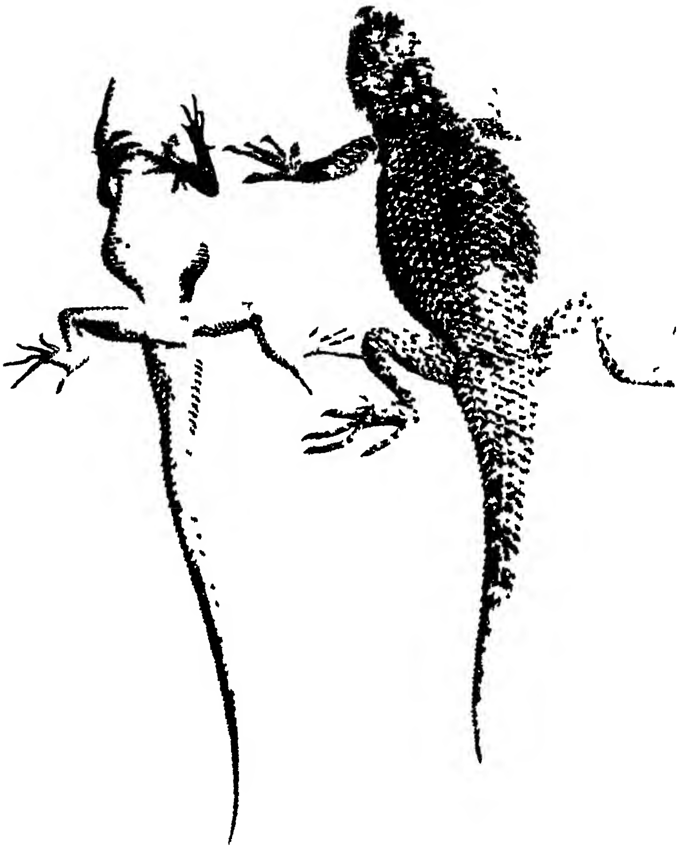

FIG. 24. Dorsal view of male, and ventral view of female, of *Sceloporus jarrovii oberon* subsp. nov. Paratypes from Mount Zapalinamé; both specimens in the private collection of Bryce C. Brown.

becoming more strongly mucronate distally; scales on sides of base of tail very strongly mucronate.

Measurements.—Snout to vent 97.5; tail 129 (tip missing); tibia 16.5; snout to occiput 18.5; snout to posterior border of ear 22.

Color.—Adult male: head jet black above, sides in front of eyes also black; subocular and lower half of temporal regions (including

all auricular lobules) light orange; area between ear and lateral gular pocket light blue, the tips of the scales orange. Entire dorsal surface of body and forelegs jet black, except for a few faint light marks (orange and blue) vaguely indicating the position of the nuchal collar; these borders outline a collar about four scales wide. Anterior half of dorsal surface of thigh, and anterior surface of the same member, black; posterior half of thigh (including posterior surface) and dorsal surface of shank light, most of the scales tipped with orange; base of tail bright orange on sides, this color changing on dorsal surface to a mixture of orange and gray-blue; remainder of dorsal surface of tail black, with narrow light (gray-blue) rings one scale wide, spaced one to three whorls apart; distally these light rings become less distinct and disappear completely. Throat and chin light blue, mixed with orange, this color sharply differentiated from the black that covers the entire ventral surfaces of the body from the gular region to the anus; sides of belly vaguely lighter; ventral surfaces of limbs also black, except hands and feet; subcaudal surface light, with a bluish tinge.

Variation.—In 100 counts (50 of each sex) the dorsals vary from 34 to 41, average 37.5; in 200 counts (equally divided) the femoral pores vary from 12 to 19, average 15.1. In 120 specimens, an azygous scale (or pair of very small scales) separate the frontoparietals 104 times (86.6 per cent), the frontoparietals contact medially 14 times, and the frontal is in contact with the interparietal 2 times. The supraoculars are regularly divided, rarely with one or two scales in the outer row; in these cases the outer scales are as large as the inner scales from which they have been separated.

In males the ventral coloration in adults is as in the type, except that usually (all except some of the largest) the scales on the sides of the belly are blue-centered. Specimens measuring about 60 mm. snout to vent and over have the middle of the belly jet black (or heavily suffused with black, in the smaller specimens); only in smaller specimens is a black border visible about the edges of the lateral belly patches. In dorsal coloration, even in the young, there is a strong suffusion with black; the collar is poorly differentiated from the dark dorsal color in all except a few which were preparing to shed their scales.

In females also the dorsal coloration is very dark, as in the males, and the nuchal collar likewise is nearly or quite indistinguishable, especially in larger specimens; the chief difference between the dorsal color of males and females is the lack in the latter of sharp differentia-

tion of the light areas on the hind legs and tail, and the complete absence of the orange color. The ventral surfaces are bluish-gray, except in the largest specimen (84 mm. snout to vent), in which they are generally suffused with black (not on throat); in a few of the larger specimens a dark area extends across the gular region.

Comparisons.—Most characteristic of this species is its black coloration. In males the light areas about the head, and especially at the base of the tail and on the posterior portion of the hind limbs, are strikingly well differentiated from the black body color. In this subspecies only is the area of the belly between the lateral belly patches entirely black in subadult as well as adult males; this type of belly pattern occurs in other subspecies of *jarrovii* only in occasional, extremely large specimens.

From *j. jarrovii* the present form is well differentiated by having usually less than 40 dorsals (usually more in *j. jarrovii*) and two rows of supraoculars (one row in *j. jarrovii*). From *j. immucronatus* it is also well differentiated by having the lateral scales (on neck, posterior temporal region, sides of body) but little smaller than the mid-dorsal scales on the same areas of the body (smaller in *immucronatus*). From both of these forms, of course, it is well differentiated in color pattern.

The closest relative of *j. oberon* is undoubtedly *j. minor*. In scutellation the latter differs by having a higher average of dorsal scales (40.6 as against 35.1 in *j. oberon*); the dorsal scales also are less mucronate, especially at the base of the tail, and generally less visibly keeled, in *j. minor*. However, the chief difference between these two subspecies rests upon pattern. In *j. minor* the ground color is very light, and the nuchal collar well defined and broad; rarely is the middle of the belly black, and never is the whole belly black.

Remarks.—Five specimens from Sierra Guadelupe, Coahuila (U.S.N.M. Nos. 47493–5, 46700, 46702), appear to belong to this subspecies (referred by Smith to *j. minor*, Kans. Univ. Sci. Bull., **24**, 1936 [1938], p. 637; see map, fig. 17, p. 622). They have slightly higher dorsal counts (38, 40, 41, 41, 41) than the average, and one adult male has the middle of the belly light. In the other two males the middle of the belly is black. In all, the dorsal coloration is nearly uniform black (except where the scales have shed). The chief difference in color is the very dark blue throat color in the three males. It is not impossible that these specimens are intergrades with *j. minor*, as indicated by the high dorsal counts and the separation of the lateral belly patches in one of the adult males.

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RECORDS OF LARGE FRESH-WATER MUSSELS

BY FRITZ HAAS

CURATOR OF LOWER INVERTEBRATES

While collecting information on maximum sizes in bivalves for the chapter "Ecology" in my forthcoming monograph on the bivalves in Bronn, I have been puzzled by the fact that the literature contains comparatively few statements on the subject, and these scattered over a wide field. It occurred to me, therefore, that a compilation of data would not be unwelcome. A difficulty arose in the very beginning in that it is not always possible to tell if the dimensions given as maximum ones for certain species really are such, since there is no exact character by which the point can be determined at which a bivalve shell is fully grown. In fact, we do not know if there is such a thing as "fully grown," since growth apparently continues throughout the life of the animal. Because of this I have not assumed that certain outstanding sizes can really be called maximum ones, but have been satisfied to list them as over average, or remarkably large specimens, or even only larger ones than those previously recorded.

The list includes only naiads or pearly fresh-water mussels, since my long occupation with this group has given me a more extensive knowledge of their sizes. Even then, of course, the list is not even approximately complete. I have omitted, with a few exceptions, information contained in any of the many monographs on the subject of naiads (e.g., Clessin, 1874; Haas, 1910b; Küster, 1854; Lea, 1834–74; Zwiesele, 1913a–d; and all of the monographs of Sowerby in the Conchologia Iconica) as well as local monographs, especially the classical one of F. C. Baker, 1928, in all of which additional information on the subject can be easily obtained.

I did collect and used in the following list, statements scattered in periodicals of every kind as well as unpublished notes on the many specimens which in the course of years have been sent me by museums and private collectors for classification and study. Being

fully aware of the incompleteness of the information thus given, I should highly appreciate any supplementary data with which my readers will be so good as to supply me.

From a taxonomic viewpoint it may not be without interest to learn from my list that in some cases younger and older shells have been previously placed in different genera, one of which became a synonym of the other when the discovery of transitional stages between the two extremes clearly showed the generic relationship. In other cases specimens of old shells have been described under a different specific name than young shells of the same animal; here, too, additional material helped to clarify the nomenclatorial status. The confusion in these cases is due to the fact that both outline and hinge of the naiads change considerably during individual growth, rendering the adult shell, under certain circumstances, apparently quite different from the young one.

The nomenclature followed in this list is, for the North American species, that of Frierson's *Classified and Annotated Check List of the North American Naiads*, 1927, and for the Palearctic species, my own tentative classification of Palearctic Unionids, published in 1940.

All measurements are in millimeters.

NORTH AMERICAN SPECIES

Anodonta grandis Say

Length 203.2. Spoon River, Illinois; Strode, 1896, p. 116.

Lasmigona costata Rafinesque

Length 157, height 90, diameter 52. Locality unknown; Field Museum No. 16306.

Length 177.8. Spoon River, Illinois; Strode, 1896, p. 116.

Lasmigona complanata Barnes

Length 216. Spoon River, Illinois; Strode, 1896, p. 116.

Tritogonia verrucosa Rafinesque

Length 190.5. Spoon River, Illinois; Strode, 1896, p. 116.

Amblema plicata plicata Say

Length 171.4. Spoon River, Illinois; Strode, 1896, p. 116.

There is some uncertainty whether the species to which Strode refers under the denomination of *Unio plicatus* Les., is what now is called *Amblema plicata plicata* or *Amblema dombeyana*. There is no *Unio plicatus* Les., as Strode writes, but a *U. plicatus* Lea, which is

a synonym for *Amblema dombeyana.* But since there are no specimens of that species from Spoon River in the Strode *Unio* collection, now in Field Museum, but several specimens of *Amblema plicata plicata* Say, there is more probability that Strode had the latter one before him when he wrote his note.

Amblema gigantea Barnes

Length 209, height 146. East Fork, White River, Indiana; Chamberlain, 1933, p. 29.

Length 216, height? Spoon River, Illinois; Strode, 1896, p. 116.

Length 216, height 150. Eagle Creek, Carroll County, Kentucky; Marshall, 1922, p. 25, U. S. Nat. Mus. No. 346631.

Length 218, height 138. Ohio River, Illinois; Chamberlain, 1933, p. 29.

Length 279, height? diameter? weight 1,816 kg. Spoon River, Illinois(?); F. C. Baker, 1928, p. 72.

Length 280, height 203. Salt River, Kentucky; Coker, 1919, p. 26.

There is an anonymous (1932) mention of a specimen of this species from the Ohio River, whose dimensions are not given, but whose age is estimated from the so-called growth rings to be 53 years. Aside from the age estimation which might have been somewhat exaggerated, the specimen in question must have been of rather outstanding dimensions.

Lampsilis recta Lamarck

Length 177.8. Spoon River, Illinois; Strode, 1896, p. 116.

Lampsilis teres Rafinesque

Length 177.8. Spoon River, Illinois; Strode, 1896, p. 115.

Lampsilis carinata Barnes

Length 266.7. Spoon River, Illinois; Strode, 1896, p. 115.

Lampsilis fragilis Rafinesque

Length 177.8. Spoon River, Illinois; Strode, 1896, p. 116.

Proptera capax Green

Length 142, height 108, diameter 88. Bone Bank, Wabash River, Indiana; Field Museum No. 11077.

Glebula suborbiculata Lamarck

Length 131, height 93, diameter 63. Green Lake, Calhoun County, Texas; Field Museum No. 15041.

Length 133.3. Arch Bayou, Texas; Strode, 1896, p. 116.

SOUTH AMERICAN SPECIES

Diplodon asuncionis Marshall

Length 87, height 52, diameter 20. Paraguayan Chaco; Amsterdam Museum.

AUSTRALIAN SPECIES

Hyridella shuttleworthi Lea

Length 133, height 70, diameter 45. Macquarie River, Australia; Senckenberg Museum, Frankfort-on-Main.

AFRICAN SPECIES

Caelatura horei E. A. Smith

Length 72, height 48, diameter 34. Lake Tanganyika; Bourguignat, 1886, p. 8, as *Unio jouberti* sp. nov.

Aspatharia petersi Martens

Length 171. Kruger Park, Union of South Africa; Haas, 1936, p. 97.

ASIATIC SPECIES

Anodonta woodiana lauta Martens

Length 240, height 140, diameter 75. Japan; Haas, 1930, p. 11.

Cristaria discoidea discoidea Lea

Length 99, height 59, diameter 39. Tonkin; Haas, 1910a, p. 499, described as *Cristaria inangulata* sp. nov.

Cristaria plicata herculea Middendorff

Length 285, height 172, diameter 85. Peking; Deshayes, 1874, p. 6, pl. 1, fig. 1.

Length 300, height 181, diameter 95. River Onon, southeast Siberia; Middendorff, 1847, p. 304.

According to a statement by Kobelt (1879, p. 145), Middendorff had specimens of his *Anodonta herculea* measuring as much as 400 mm. This statement, which made the species in question by far the largest of all naiads and which has been frequently quoted in the literature, unfortunately can not stand close inspection. Middendorff (1847, p. 304) does speak of a specimen of *A. herculea* 0.41 long, but the unit connected with this numeric statement is not the meter, but the decimeter, as stated by him above; thus, the measurement under consideration is not 410 mm., as erroneously supposed by Kobelt, but only 41 mm., which is in conformity with statements in the text referring to the specimen in question as very young, but already typical.

Cristaria plicata spatiosa Clessin

Length 240, height 120, diameter 70. Japan; Simpson, 1914, p. 229.

Length 258, height 143, diameter 70. Lake Biwa, Japan. Field Museum No. 2583.

Length 274, height? diameter? Japan; Kobelt, 1879, p. 145.

Lanceolaria grayana Lea

Length 170, height 44, diameter 39. Tonkin; Haas, 1910b, p. 46, pl. 2, fig. 1.

Lanceolaria cylindrica Simpson

Length 167, height 36, diameter 32. Ussuri River, eastern Siberia; Haas, 1910b, p. 60.

Length 171, height 35, diameter 32. Ussuri River, eastern Siberia; Haas, 1910b, p. 60, pl. 5, figs. 1–2.

Simpson (1900), the author of this species, gave some incorrect measurements and some erroneous information about it, both of which have been straightened out (Haas, 1910b, p. 60). As to the special new section of *Lanceolaria* founded by Simpson for his *cylindrica,* I am, after having studied part of the original material collected by Schrenck, on which Simpson's *cylindrica* is based, rather doubtful about its validity and have ventured the suggestion that both the new section, *Cylindrica,* and the new species, *cylindrica,* described by Simpson are female specimens of *Lanceolaria grayana* Lea, maybe of a northern subspecies of it; but all this is still open to argument.

Lanceolaria oxyrhyncha Martens

Length 100, height? diameter? Japan; Ihering, 1893, p. 156.

Oxynaia pugio Benson

Length 100, height 38, diameter 35. India; Haas, 1923, p. 196; type of *Unio digitiformis* Sowerby.

Acuticosta chinensis Lea

Length 66, height 43, diameter 31. Niho River, Shantung, China; Haas, 1914, p. 241, pl. 30, fig. 1.

Schistodesmus lampreyanus Baird and Adams

Length 57, height 37, diameter 28. China; Simpson, 1914, p. 940.

Contradens ascia dimotus Lea

Length 84, height 57, diameter 38.5. Pajacombo, Sumatra; Haas, 1914, p. 203, pl. 22, fig. 5. Made the type of an invalid new genus, *Schizocleithrum.*

Parreysia favidens Benson

Length 77, height 55, diameter 40. Bengal; Berlin Museum.

Indonaia substriata Lea

Length 70, height 39.5, diameter 28. Bangkok, Thailand; collection of Dr. E. Paravicini, Basel, Switzerland.

Lamprotula nodulosa Wood

Length 138, height 90, diameter 90. Rivière Claire, Tonkin; Rolle, 1904, p. 25, pl. 3, pl. 4, fig. a; described as *Unio* (*Quadrula*) *liedkei* sp. nov.

Caudiculatus caudiculatus Martens

Length 84, height 60, diameter 32.5. Soengei Sangei River, Borneo; Haas, 1927, p. 21.

Length 87, height 63, diameter 32.5. Soengei Sangei River, Borneo; Haas, 1927, p. 21.

Hyriopsis cumingii Lea

Length 264, height 189, diameter 69. Tonkin; Rolle, 1904, p. 25, pls. 1, 2; described as *Hyriopsis goliath* sp. nov.

Chamberlainia hainesiana Lea

Length 237, height 152, diameter 92. Mekong; Rochebrune, 1882, p. 27, pl. 1, fig. 2; described as *Unio duclerci* sp. nov.

Length 261, height 170, diameter 83. Rivière Claire, Tonkin; Rochebrune, 1904, p. 465; described as *Simpsonia demangei* gen. et sp. nov.

PALEARCTIC SPECIES

Margaritifera auricularia auricularia Spengler

Length 153, height 72, diameter 41. Adour River, southwestern France; Rossmaessler, 1854, pl. 70, fig. 853.

Length 150–180, height 60–90, diameter 30-48. Locard, 1893, p. 152.

Margaritifera margaritifera dahurica Middendorff

Length 177, height 69, diameter 40. Amur River, eastern Siberia; Shadin, 1938, p. 111.

Psilunio littoralis littoralis Lamarck

Length 60–80, height 40–48, diameter 20–28. France; Locard, 1893, p. 152.

Length 91, height 54, diameter 23. Abbeville, northeastern France; Rossmaessler, 1836, pl. 13, fig. 195, as *Unio sinuatus* (=*Margaritifera a. auricularia* in modern nomenclature), but

obviously *Psilunio l. littoralis* as corroborated by the locality given, which is out of the range of the actual distribution of *M. a. auricularia*, but within that of *P. l. littoralis*.

Psilunio littoralis umbonatus Rossmaessler

Length 92, height 64, diameter 31. Guadalquivir River at Seville, Spain; Bourguignat, 1865, p. 339, pls. 17–18.

Pseudodontopsis euphraticus Bourguignat

Length 120, height 80, diameter 40. Euphrates River, Iraq; Bourguignat, 1856, p. 71, pl. 8, fig. 6, pl. 9, fig. 1.

Anodonta cygnea Linnaeus

Length 177.8, height? diameter? Sutton-in-Ashfield, Notts., England; Musson, 1884, p. 112.

Length 193.6, height? diameter? Sutton-in-Ashfield, Notts., England; Musson, 1884, p. 112.

Length 200, height 95, diameter 80. Platschütz, near Altenburg, Thuringia, Germany; Rossmaessler, 1854, pl. 89, fig. 968; described as var. *cordata*.

Length 210, height 118, diameter? Germany, no exact locality; Rossmaessler, 1837, pl. 25, fig. 342.

Length 222, height 96, diameter 82. Hummelshayn, Thuringia, Germany; Israel, 1913, as *A. cellensis* Gmelin.

Length 260, height 130, diameter 100. Siematycze, Bielsk County, Poland; Feliksiak, 1930, p. 135, pl. 4.

Anodonta vescoiana Bourguignat

Length 135, height 84, diameter 63. Nahr Bahlik, tributary of Euphrates; Pallary, 1933, p. 150; 1939, p. 121, pl. 7, fig. 1.

Length 140, height? diameter? Nahr Bahlik, tributary of Euphrates; Pallary, 1933, p. 150.

Described as *Anodonta* (*Euphrata* sect. n.) *bahlikiana* Pallary; the figure recently given by Pallary makes it impossible to see anything else in *A.* (*Euphrata*) *bahlikiana* than a typical *Anodonta vescoiana* Bourguignat.

Pseudanodonta middendorffi middendorffi Siemaschko

Length 98, height 50, diameter 22. Achtanisov-Liman, southern USSR; Kobelt, 1911, p. 53, pl. 476, fig. 2549; described as *Pseudanodonta complanata euxina* Kobelt.

Pseudanodonta middendorffi compacta Zelebor

Length 98, height 50, diameter 23. Moravia; Kobelt, 1911, p. 51, pl. 475, figs. 2545–46.

Unio crassus crassus Retzius

Length 95, height 48, diameter 37. Livonia, Baltic USSR; Riemschneider, 1907, p. 42, fig.; as *Unio pseudolittoralis* Clessin.

Length 100, height 54, diameter 42. River Tapsaue, Schleswig; Kobelt, 1872, p. 142, pl. 5; described as *Unio crassus* var. *maximus* var. nov.

Length 85–110, height 42–45, diameter 32–36. Central Sweden; Westerlund, 1890, p. 66, as *Unio ater* var. *elegans* Westerlund.

Unio crassus gontieri Bourguignat

Length 110, height 52, diameter 44. River Irenj, Perm, USSR; Kobelt, 1912, p. 24, pl. 490, figs. 2622–23; described as *Unio kungurensis* sp. nov.

Unio crassus cytherea Kuster

Length 86, height 41, diameter? St. Leonhard near Maribor, Carniolia, Jugoslavia; Rossmaessler, 1838, pl. 35, fig. 491; as *Unio consentaneus legitimus* Rossmaessler.

Length 86, height 40, diameter? Creek Sechta at Unterschneidheim, Württemberg, Germany; Haas and Schwarz, 1913, pl. 2, fig. 7.

Length 90, height 44, diameter 31. Sajóudvarhely, Hungary; Czogler and Rotarides, 1936, p. 151.

Unio pictorum pictorum Linnaeus

Length 117.5, height 55, diameter? Fleckney, Leicestershire, England; Taylor, 1884, p. 224.

Length 118, height 46, diameter? Pond of St. Gotthard, Merseburg, Germany; Rossmaessler, 1837, pl. 29, fig. 409.

Length 119.4, height 54.6, diameter? Wiston, England; Norman, 1857, p. 5759.

Length 120, height? diameter? Skerneso, Falster, Denmark; Schlesch, 1933, p. 131.

Length 124, height 55, diameter? Ossington Lake, Notts., England; Taylor, 1884, p. 224.

Length 130.9, height? diameter? River Weise near Namslau, Silesia, Germany; C. Boettger, 1935, p. 141. Partly regarded as hybrids between *Unio pictorum* and *U. tumidus*.

Length 131.7, height? diameter? Ossington Lake, Notts., England; Gain, 1884, p. 112.

Unio pictorum latirostris Küster

Length 100, height 34, diameter 32. Ponds of River Tisza, Hungary; Czogler and Rotarides, 1936, p. 152.

Length 105, height 38, diameter 32. Ponds of River Tisza, Hungary; Czogler and Rotarides, 1936, p. 152.

Unio pictorum platyrhynchus Rossmaessler

Length 125, height 48, diameter? St. Leonhard near Maribor, Carniolia, Jugoslavia; Rossmaessler, 1844, pl. 59, fig. 767; described as *Unio pictorum* var. *ponderosus* Spitzi.

Length 128, height? diameter? Same locality and, too, as var. *ponderosus;* Kuster, 1854, p. 87, pl. 23, fig. 3.

Unio pictorum schrenckianus Clessin

Length 137, height? diameter? USSR; Shadin, 1938, p. 77, as *U. pictorum* var. *ponderosus* Spitzi.

Unio tumidus tumidus Retzius

Length 109.2, height 65.6, diameter? Fleckney, England; Norman, 1857, p. 5758.

Length 120, height 60, diameter 54. Berzence, Hungary; Czogler and Rotarides, 1936, p. 147.

Length 120.6, height 66.6, diameter? Regston, Derbyshire, England; Fowler, 1877, p. 67.

Length 123, height 61, diameter 48. Berzence, Hungary; Czogler and Rotarides, 1936, p. 147.

Length 125, height 65, diameter? River Werra, Germany; Israel, 1913.

Unio tumidus borysthenensis Kobelt

Length 104, height 50, diameter 41. Rivers Ik and Oka, USSR; Shadin, 1938, p. 81, fig. 19; described as *Unio tumidus* var. *bashkiricus* var. nov.

Unio pictorum platyrhynchoideus Dupuy

Length 112-136, height 35–65, diameter 38–40. France; Locard, 1893, p. 199, as *Unio danielis* Gassies.

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EXTERNAL CHARACTERS OF THE BATS OF THE SUBFAMILY GLOSSOPHAGINAE

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Although there is great general similarity in the external appearance of many of the genera of bats in the subfamily Glossophaginae, careful study indicates that external characters exist by which fresh or alcoholic material may be generically determined without examination of the skulls.

The proportionate length of the bones in the wings is the most obvious character. This is supplemented by the presence or absence of a tail, the size of the noseleaf and ears and, in some cases, the presence or absence of lower incisors.

All genera but one have been examined. Of two genera but one specimen each has been available and, although this is not adequate, certain characters are indicated that more material will no doubt clearly establish.

I am indebted to the late Dr. Glover M. Allen of the Museum of Comparative Zoology for the loan of a specimen of *Hylonycteris* and to Dr. H. E. Anthony of the American Museum of Natural History for specimens of the genus *Choeroniscus*. The drawings of the wings were made by Mr. John Erker.

Subfamily Glossophaginae

Characterized by an elongated rostrum, small ears, a well-developed but small noseleaf, a very short tail or none at all, small or medium size, and the proportions of the metacarpals, in which the third is the longest, the fourth intermediate, and the fifth the shortest.

The genera fall roughly into two groups, distinguished as follows:

I. First phalanx of third finger *more* than one-third the length of the metacarpal; second phalanx of third finger *less* than one

and one-half times the length of the first phalanx: *Platalina, Choeronycteris, Glossophaga, Choeroniscus, Scleronycteris, Lichonycteris, Hylonycteris.*

II. First phalanx of third finger *less* than one-third the length of the metacarpal: *Anoura, Lonchoglossa, Leptonycteris, Lionycteris, Lonchophylla, Monophyllus.*

The genera of the second group separate into two divisions with the following characters:

(a) Second phalanx of third finger *more* than one and one-half times the length of the first phalanx: *Anoura, Lonchoglossa, Lionycteris,* and the larger species and individuals of *Lonchophylla* and *Leptonycteris.*

(b) Second phalanx of third finger *usually less* than one and one-half times the length of the first phalanx: Smaller species and individuals of *Lonchophylla* and *Leptonycteris.* Always less in *Monophyllus,* in which the first phalanx of the fourth finger is *shorter* than the first phalanx of the fifth finger.

KEY TO GENERA OF GLOSSOPHAGINAE BASED ON EXTERNAL CHARACTERS

First phalanx of third finger *more* than one-third the length of the metacarpal.
  Second phalanx of third finger *less* than one and one-half times the length of the first phalanx.
    Larger, forearm 43.7–48.7.
      Forearm 48.3–48.7, lower incisors present.
        Central and southern Peru .... *Platalina.*
      Forearm 43.7–45.8, no lower incisors.
        Arizona to Guatemala... .... *Choeronycteris.*
    Smaller, forearm 32.4–40.
      Fur of back bicolored.
        Lower incisors present, ears and noseleaf larger.
          Central Mexico to Brazil.. .... *Glossophaga.*
        No lower incisors, ears and noseleaf smaller.
          Guatemala to Peru and the Guianas... . ... *Choeroniscus.*
          Ega, Amazonas, Brazil.. .. .. *Scleronycteris.*
      Fur of back tricolored.
        Ears and noseleaf shorter, wings to base of outer toe, forearm hairy.
          Nicaragua, Costa Rica, Dutch Guiana, and Brazil...... *Lichonycteris.*
        Ears and noseleaf longer, wings to ankles, forearm less hairy.
          Southern Mexico and Costa Rica...................... *Hylonycteris.*
First phalanx of third finger *less* than one-third the length of the metacarpal.
  Second phalanx of third finger *more* than one and one-half times the length of the first phalanx.
    No lower incisors.
      Tail absent, forearm 40–47... . ...*Anoura.*
      Tail present, but hidden, forearm 34.3–38.1................ *Lonchoglossa.*

Lower incisors present.
Tail absent, forearm 47.7–56.6 . . *Leptonycteris.*
Tail present, about half the length of the membrane.
Noseleaf low, broad, with median line; forearm 34.9–36 . *Lionycteris.*
Noseleaf high, without median line; forearm 38–42.8 . . . *Lonchophylla.*

Second phalanx of third finger *usually less* than one and one-half times the length of the first phalanx.
Tail absent, forearm 46.4–51.4 . . *Leptonycteris.*
Tail present, about half the length of the membrane, forearm 30–36.7. *Lonchophylla.*
Tail present, longer than membrane.
West Indies . *Monophyllus.*

SYNOPSIS OF THE GENERA

Genus **Platalina**

Characters.—Forearm 48.3–48.7 mm.; lower incisors present. First phalanx of fifth finger *longer* than one-fourth the length of the metacarpal. Noseleaf somewhat diamond-shaped, upper half triangular, sides converging in lower half, projection on each side at the widest part. Tragus well developed, a small projection at top of inner edge and very concave at top of outer edge.

Dental formula.—I $\frac{2-2}{2-2}$, C $\frac{1-1}{1-1}$, Pm $\frac{2-2}{3-3}$, M $\frac{3-3}{3-3}$ = 34

Species.—*P. genovensium;* central and southern Peru.

Genus **Choeronycteris**

Characters.—Forearm 43.7–45.8 mm.; no lower incisors. First phalanx of fifth finger *shorter* than one-fourth the length of the metacarpal. Noseleaf triangular and tragus rounded, with very fine serrations on its outer edge. The teeth are lighter and more widely spaced than those of *Platalina.*

Dental formula.—I $\frac{2-2}{0-0}$, C $\frac{1-1}{1-1}$, Pm $\frac{2-2}{3-3}$, M $\frac{3-3}{3-3}$ = 30

Species.—*C. mexicana;* southern Arizona south through Mexico to Guatemala.

Genus **Glossophaga**

Characters.—Forearm 32.4-40 mm.; lower incisors present. Fur of back bicolored; forearm bare. Noseleaf and ears larger than in other genera of same bodily size.

Dental formula.—I $\frac{2-2}{2-2}$, C $\frac{1-1}{1-1}$, Pm $\frac{2-2}{3-3}$, M $\frac{3-3}{3-3}$ = 34

Species.—*G. soricina* and subspecies; central Mexico south to southern Peru, Paraguay and Brazil, and Jamaica in the West Indies. *G. longirostris* and *elongata;* southern Lesser Antilles. Curaçao, coasts of Colombia and Venezuela.

Genus Choeroniscus

Characters.— Forearm 34.1 35.2 mm.; no lower incisors. Fur of back bicolored; noseleaf and ears smaller than in *Glossophaga*.

Dental formula.—I $\frac{2\ 2}{0\ 0}$, C $\frac{1\ 1}{1\ 1}$, Pm $\frac{2\ 2}{3\ 3}$, M $\frac{3\ 3}{3\ 3}$=30

Species.—*C. minor;* Dutch Guiana. *C. inca;* Peru. *C. intermedia;* Trinidad and British Guiana. *C. godmani;* Guatemala.

Genus Scleronycteris

Characters.—Forearm 35; no lower incisors. Fur of back bicolored. None examined but from available measurements and description appears to belong in this group.

Dental formula.—I $\frac{2-2}{0-0}$, C $\frac{1-1}{1-1}$, Pm $\frac{2-2}{3-3}$, M $\frac{3-3}{3-3}$=30

Species.—*S. ega;* Ega, Amazonas, Brazil.

Genus Lichonycteris

Characters.—Forearm 33.5 mm.; no lower incisors. Fur of back tricolored; base of forearm well-haired; wing attached at base of outer toe. First phalanx of fifth finger more than one-fourth the length of the metacarpal. One specimen examined.

Dental formula.—I $\frac{2-2}{0-0}$, C $\frac{1-1}{1-1}$, Pm $\frac{2-2}{3-3}$, M $\frac{2-2}{2-2}$=26

Species.—*L. obscura;* Nicaragua, Costa Rica and Dutch Guiana. *L. degener;* Para, Brazil.

Genus Hylonycteris

Characters.—Forearm 33.5 mm.; no lower incisors. Fur of back tricolored; base of forearm partly haired; wing attached at base of ankle. First phalanx of fifth finger less than one-fourth the length of the metacarpal. One specimen examined.

Dental formula.—I $\frac{2-2}{0-0}$, C $\frac{1-1}{1-1}$, Pm $\frac{2-2}{3-3}$, M $\frac{3-3}{3-3}$=30

Species.—*H. underwoodi;* Costa Rica and southern Mexico.

Genus Anoura

Characters.—Forearm 40–47 mm.; no lower incisors; tail absent. First phalanx of fifth finger less than one-fourth the length of the metacarpal.

Dental formula.—I $\frac{2-2}{0-0}$, C $\frac{1-1}{1-1}$, Pm $\frac{3-3}{3-3}$, M $\frac{3-3}{3-3}$=32

Species and subspecies.—*A. geoffroyi geoffroyi;* Brazil, Bolivia, Venezuela, and Trinidad. *A. g. peruana;* Andes of Peru, Ecuador, and Colombia. *A. g. lasiopyga;* Mexico, Guatemala, and El Salvador.

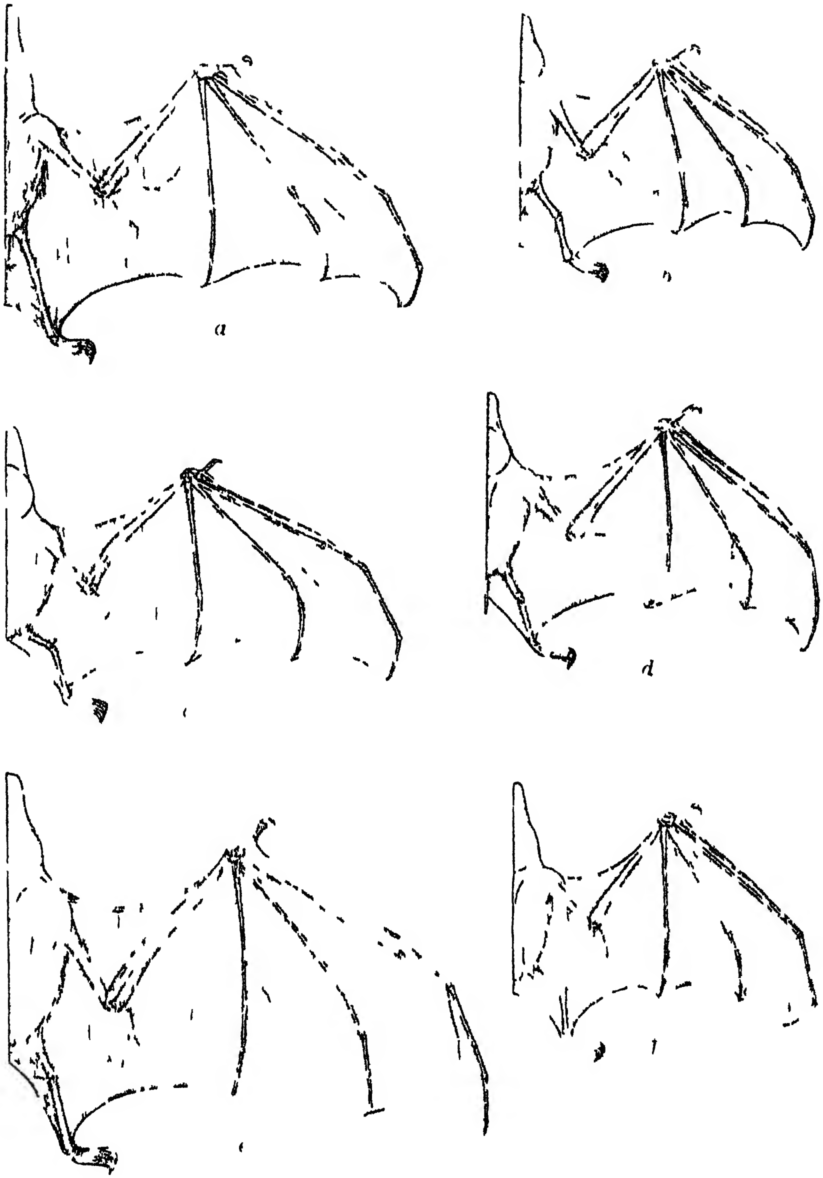

FIG. 25. Wings of a, *Choeronycteris mexicana;* b, *Glossophaga s. leachi;* c, *Anoura geoffroyi;* d, *Monophyllus cubanus;* e, *Leptonycteris nivalis,* f, *Lonchoglossa caudifera.* All about ×1½.

Genus **Lonchoglossa**

Characters.—Forearm 34.3–38.1 mm.; no lower incisors; tail very short and hidden in base of membrane.

Dental formula.—I $\frac{2-2}{0-0}$, C $\frac{1-1}{1-1}$, Pm $\frac{3-3}{3-3}$, M $\frac{3-3}{3-3}$=32

Species and subspecies.—*L. caudifera;* Colombia and Venezuela to central Brazil. *L. c. aequatoris;* Ecuador and western Peru.

Genus **Lionycteris**

Characters.—Forearm 34.9–36 mm.; lower incisors present; tail present, about half the length of membrane. Noseleaf low, very broad, sides almost convex, with a well-marked median line.

Dental formula.—I $\frac{2-2}{2-2}$, C $\frac{1-1}{1-1}$, Pm $\frac{2-2}{3-3}$, M $\frac{3-3}{3-3}$=34

Species.—*L. spurrelli;* western Colombia and southern British Guiana.

Genus **Lonchophylla**

Characters.—Lower incisors present; tail present, about half the length of membrane. Noseleaf high and narrow; no median line.

First division: Forearm 38–42.8 mm. *L. robusta;* Panama and Colombia. *L. hesperia;* Zorritos, Peru.

Second division: Forearm 30–36.7 mm. *L. mordax;* Bolivia, Brazil. *L. thomasi;* Venezuela. *L. concava;* Panama.

Dental formula.—I $\frac{2-2}{2-2}$, C $\frac{1-1}{1-1}$, Pm $\frac{2-2}{3-3}$, M $\frac{3-3}{3-3}$=34

Remarks.—The only genus that might be confused with *Lonchophylla* is *Lionycteris*, but size will separate the larger forms from it, and the shape of the noseleaf and the shorter second phalanx of the third finger will separate the smaller forms. *L. robusta* and *mordax* are the only species that have been examined.

Genus **Leptonycteris**

Characters.—Forearm 46.4 56.6 mm.; lower incisors present; tail absent. The largest member of the subfamily. The larger specimens coming from Texas and eastern Mexico belong to the first division, while those from Arizona, western Mexico, Guatemala, and Curaçao belong in the second division. Intermediates are known from the states of Jalisco and Michoacan.

Dental formula.—I $\frac{2-2}{2-2}$, C $\frac{1-1}{1-1}$, Pm $\frac{2-2}{3-3}$, M $\frac{2-2}{2-2}$=30

Species.—*L. nivalis;* southern Arizona and Texas through Mexico to Guatemala. *L. curasoae;* Curaçao and Aruba Islands, Dutch West Indies.

Genus **Monophyllus**

Characters.—Forearm 36-42 mm.; lower incisors present; tail comparatively long, free beyond the edge of the membrane for about half its length.

Dental formula.—I $\frac{2}{2}$ $\frac{2}{2}$, C $\frac{1}{1}$ $\frac{1}{1}$, Pm $\frac{2-2}{3-3}$, M $\frac{3-3}{3-3}$=34

Species.—Confined to the West Indies. *M. redmani;* Jamaica. *M. cubanus;* Cuba. *M. c. ferreus;* Haiti. *M. portoricensis* and *M. frater;* Porto Rico. *M. plethodon;* Barbados. *M. luciae;* Santa Lucia. *M. clinedaphus;* locality unknown.

Remarks.—*M. cubanus* is the only species that has been examined.

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PERUVIAN SNAKES FROM THE UNIVERSITY OF AREQUIPA

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A considerable collection of snakes and of some other reptiles and amphibians in the collection of the University of Arequipa, at Arequipa, Peru, was lent to the senior author in 1939 through the courtesy of Dr. Corzo Masias, of the Department of Zoology, and at the suggestion also of Dr. Carlos Nicholson, Professor of Biogeography at the university. This material, all unidentified, was partly without data as to locality; but a series of specimens from the faunally little-known Department of Madre de Dios gives it sufficient importance to warrant publication of a list of the forty-seven species of snakes in the collection. Two species are described as new. Much of this collection was assembled through the efforts of the late Dr. Edmundo Escomel, long resident in Arequipa.

The specimens without data are undoubtedly all from Peru, and most of them are probably from the Department of Madre de Dios. The remaining material comes from the following localities or regions:

Chanchamayo: A tropical lowland locality at the headwaters of the Rio Perené in the Department of Junín.

Montaña: A term used for the forested tropical lowlands of eastern Peru.

Madre de Dios: A department of Peru, much of it a tropical lowland region bordered by mountains on the south.

Selvas de Sandia: The tropical lowlands below Sandia in the Department of Puno.

Boundary of Peru and Bolivia: Collections resulting from a boundary survey expedition, departments of Puno and Madre de Dios.

Arequipa: The vicinity of Arequipa in the Department of Arequipa; a semi-arid region of 7,000 to 8,000 feet elevation, on the Pacific slope.

Vitor Valley: A valley crossing the coastal desert of the Department of Arequipa below Arequipa.

Majes Valley: The long valley to the north of the Vitor Valley, Department of Arequipa.

Tambo: A small town on the Rio Tambo, in the southern part of the Department of Arequipa.

An annotated list of the species in the collection follows.

Boa hortulana hortulana Linnaeus

Boa hortulana Linnaeus, Syst. Nat., 1, p. 216, 1758—America.

Three specimens from Madre de Dios, collected by Sr. Valdivia, agree with the typical subspecies. The midbody scale rows range from 51 to 55. The single male, U.A. No. 124, has ventrals 276; caudals 117. The two females, U.A. Nos. 123 and 126, have ventrals and caudals respectively 282, 113, and 280, 113.

Helicops polylepis Günther

Helicops polylepis Gunther, Ann. Mag. Nat. Hist., (3), 7, p. 426, 1861—upper Amazon.

Two female specimens, U.A. Nos. 127 and 133, collected by Sr. Valdivia in Madre de Dios, have the dorsal scale formulae 23–23–19 and 23–23–17; ventrals 123, 128; caudals 73, 72. They agree well with the usual description of this species except that in No. 127 the rostral is separated from the internasal by a contact of the nasals behind it. In No. 133 the scales of the occiput and outer row are not keeled, but this may be owing to poor preservation.

Drymobius dendrophis Schlegel

Herpetodryas dendrophis Schlegel, Phys. Serp., 2, p. 196, 1837—Cayenne.

Drymobius dendrophis Cope, Proc. Acad. Nat. Sci. Phila., p. 561, 1860.

A female specimen, U.A. No. 79, from the Escomel Collection, but without other data, agrees very well with the definition of this form. It has ventrals 162, tail incomplete; olive above with black-edged narrow white crossbands. This specimen extends the range of the species south from Ecuador into Peru.

Dryadophis boddaertii boddaertii Sentzen

Coluber boddaertii Sentzen, Meyer's Zool. Arch., 2, p. 59, 1796—type locality unknown.

Dryadophis boddaertii boddaertii Stuart, Mus. Zool. Univ. Mich., Misc. Publ., 48, p. 66, 1941.

A single male specimen, U.A. No. 174, without data, and two females, U.A. Nos. 107a and 120, from Chanchamayo, collected by Coronel Zapata. The two females, which are adult and agree well with the typical subspecies, have ventrals 192, 196, and caudals 108, 112, respectively. The male, a juvenile specimen, has ventrals 185 and caudals 118. Its coloration resembles that given for adults of *pulchriceps* (Stuart, 1941, p. 51). Stuart (l.c., p. 32) regards this as the primitive pattern for the group, and accordingly to be expected in the young of the more specialized forms.

Drymarchon corais corais Boie

Coluber corais Boie, Isis, p. 537, 1827—America.

Drymarchon corais corais Barbour and Noble, Proc. U. S. Nat. Mus., 58, p. 617, 1921.

One female specimen, U.A. No. 155, without data, agrees with the typical subspecies. The ventrals are 216, the caudals 77, with the first fourteen entire. This specimen, a juvenile individual, has the scales slightly oblique and is marked with crossbands.

Chironius carinatus Linnaeus

Coluber carinatus Linnaeus, Syst. Nat., 1, p. 223, 1758—"Indiis."

Chironius carinatus Fitzinger, Neue Classif. Rept., p. 60, 1826.

Chanchamayo, U.A. No. 103, Coronel Zapata; Madre de Dios, U.A. No. 72, Sr. Juan Perea, and U.A. No. 129, Sr. Valdivia; Selvas de Sandia, U.A. No. 27; Peru (without other data), U.A. Nos. 129, 161, 167, 169.

The dorsal formula is 12–12–8 in all except No. 129, in which it is 12–12–10. The ventrals range from 141 to 153 in males and from 145 to 156 in females; the caudals 133 to 135 in males and 128 to 134 in females. The supralabials are 9, the fourth, fifth and sixth entering the eye. The infralabials are 10 in male and 11 in female specimens. Oculars 1–2, and temporals 1–2.

The series is variable in coloration. Some specimens are uniform olive or brown above and below, while others are marked above with white spots that merge in narrow crossbands. All types are possible within the range of variation as described by Boulenger (1894, p. 73), but in our opinion his concept of the species is composite.

Chironius multiventris sp. nov.

Type from the Department of Madre de Dios, Peru. No. 38250 Field Museum of Natural History. Female, collected by Sr. Valdivia.

Range.—Tropical lowland regions of eastern Peru.

Diagnosis.—A *Chironius* closely allied to *carinatus,* but differing in having ventrals 178 to 183 and caudals 172 to 202 as opposed to previous maxima (known to us) for Peruvian *carinatus* of ventrals 156 and caudals 135. The dorsal scale formula of 12–12–10 further separates it from *carinatus,* which normally has 12–12–8. The infralabials in these two females are 10–10 and 10–11, as opposed to 11 for the females of *carinatus.* In coloration this species is closely allied to *carinatus.*

Description of type.—Body elongate, strongly compressed; tail long; head slightly elongate, wider than the body.

Rostral broader than deep, just visible from above; internasals slightly smaller than the prefrontals; frontal two-thirds to three-fourths as broad as long, slightly longer than its distance from the end of the snout, slightly shorter than the parietals; supraoculars large; nostril large; loreal longer than deep; 1 preocular on the right side, 2 on the left; 2 postoculars; 9 supralabials with the fourth, fifth and sixth entering the eye; 10 infralabials on the right side, 11 on the left; temporals 1–2.

Scales of uppermost pair of vertebral rows weakly keeled, at least posteriorly, rest smooth, lateral scales oblique; dorsal formula 12–12–10; ventrals 183; anal divided; caudals 172.

The anterior part of the body is olive above, giving way to light brown posteriorly. A narrow, whitish, black-edged, vertebral stripe (yellow in life?) gradually develops on the neck and disappears posteriorly. Beginning slightly anterior to midbody, the ground color is broken at intervals of three or four scales by narrow whitish crossbands about one scale wide, bordered by dark brown, and gradually disappearing in the tail. The supralabials and the under side of the body are yellowish. The ground color encroaches on the edge of the ventrals, which are bordered by a dark line anteriorly. This is still more distinct in the caudals. The posterior part of the lower surface of the body has a median dark streak to the anus.

Total length 1,250; tail 490.

Notes on paratype.—The single paratype, U.A. No. 107, from Chanchamayo, not very well preserved, agrees well with the type in scale characters. The nostril is large, between two nasals, as is

probably the case in the type, in which the condition is somewhat obscure; 1 preocular on each side; 10 infralabials on each side; temporals 1-1; ventrals 178; caudals 202.

In coloration, the paratype agrees fairly well with the type, for it has the light crossbands and vertebral stripe. The ground color, however, is uniform olive throughout, and the lateral scales of the dark areas are bordered on their lower edges with black. This tends to obscure the vertebral stripe. Posteriorly the light crossbands are closer together than on the type, often only two scales apart.

Total length 1,360; tail 560.

Remarks.—*C. multiventris* is close to *carinatus* as re-described by Boulenger (1894, p. 73), and a revision of that composite form may prove it to be a subspecies. *C. multiventris* and *C. carinatus*, however, occur in the same region in Peru, evidently without intergrading.

Chironius fuscus Linnaeus

Coluber fuscus Linnaeus, Syst. Nat., 1, p. 222, 1758—Asia, in error.

Chironius fuscus Amaral, Mem. Inst. Butantan, 4, p. 84, 1930.

One male specimen, U.A. No. 76, without data, has the dorsal scale formula 10–10–8; ventrals 156; caudals 118. It is a green snake that fits type B of Boulenger (1894, p. 76), or *viridis* Duméril and Bibron. In our opinion *fuscus*, as redescribed by Boulenger, is also a composite species.

Leptophis occidentalis nigromarginatus Günther

Ahaetulla nigromarginatus Gunther, Ann. Mag. Nat. Hist., (3), 8, p. 28, 1866—upper Amazon

Leptophis occidentalis nigromarginatus Amaral, Mem. Inst. Butantan, 4, p. 85, 1930.

Madre de Dios, U.A. Nos. 130, 136, Sr. Valdivia; montaña, U.A. No. 34, Sr. Juan Perea.

Dromicus chamissonis Wiegmann

Coronella chamissonis Wiegmann, Nova Acta Acad. Caes.-Leop. Carol., 17, p. 246, 1835—Tollo, Chile.

Dromicus chamissonis Steindachner, Reise der Novara, Rept., p. 65, 1867.

Eight specimens: Arequipa, U.A. No. 38; Madre de Dios, U.A. Nos. 65, 139, 141, Sr. Valdivia; Selvas de Sandia, U.A. No. 15,

Alberto Zimmermann; Tambo, U.A. No. 11; Vitor Valley, U.A. 10; Peru (without other data), U.A. No. 85, Escomel Collection.

The ventrals range from 195 to 204 in the males, and from 205 to 220 in the females; the caudals range from 111 to 125 in the males, and from 102 to 112 in the females. These specimens from Peru are certainly not the Chilian *chamissonis* of Wiegmann, being very distinct in coloration. Further study of these specimens is reserved for a report on the coastal fauna of Peru, in progress.

The three specimens said to be from the Madre de Dios region are indistinguishable from the coastal form in squamation, coloration, dentition, and penial characters. It is possible that they have been mislabeled.

Leimadophis reginae Linnaeus

Coluber reginae Linnaeus, Syst. Nat., 1, p. 219, 1758—"Indiis."

Leimadophis reginae Amaral, Proc. U. S. Nat. Mus., 67, Art. 24, p. 5, 1925.

Boundary of Peru and Bolivia, U.A. No. 18, Dr. Valdez; Chanchamayo, U.A. No. 104, Coronel Zapata; Madre de Dios, U.A. Nos. 58 (head only), 60, 62, 122, Sr. Valdivia; montaña, U.A. No. 30; no data, U.A. No. 176.

The ventrals are 148 and 149 respectively in the two males; tail incomplete in both. In the six females the ventrals range from 146 to 158; and the caudals from 64 to 74 in the three with complete tails. These specimens agree in coloration with typical representatives of the species, and exhibit the normal change of color pattern from young to adult.

Lygophis taeniurus taeniurus Tschudi

Liophis taeniurus Tschudi, Fauna Peruana, Herp., p. 51, pl. 5, 1845—forest region of Peru.

Lygophis taeniurus taeniurus Amaral, Mem. Inst. Butantan, 4, p. 20, 1930.

One adult female specimen, U.A. No. 157, without data, agrees with the typical subspecies, with 163 ventrals and 54 caudals. A second juvenile specimen, U.A. No. 57, from the Department of Madre de Dios, is too fragmentary to yield a scale count. It is best referred to this subspecies, but lacks the characteristic dark longitudinal lines on the posterior part of the body and tail.

Xenodon severus Linnaeus

Coluber severus Linnaeus, Syst. Nat., 1, p. 219, 1758—Asia, in error.

Xenodon severus Schlegel, Phys. Serp., 2, p. 83, 1837.

Boundary of Peru and Bolivia, U.A. Nos. 16, 17, Dr. Valdez; Chanchamayo, U.A. No. 109, Coronel Zapata; Madre de Dios, U.A. No. 140, Sr. Valdivia; no data, U.A. No. 173.

The four males have ventrals 127–139; caudals 37–41. The single female has ventrals 136; tail incomplete. This series agrees very well with available descriptions in coloration. There are 9–2 to 10–2 dark crossbands evident in all, but these are obscured in No. 109, a half-grown individual. The remaining specimens are juvenile; the abdomens in Nos. 16 and 17 are still full of yolk.

Liophis cobella cobella Linnaeus

Coluber cobella Linnaeus, Syst. Nat., 1, p. 218, 1758—America.

Liophis cobella cobella Amaral, Bull. Antiven. Inst. Amer., 4, p. 87, 1931.

One male specimen, U.A. No. 170, without data, has ventrals 142 and caudals 52. This specimen has 39 + 15 black annuli, very narrowly separated by yellow annuli that widen laterally and ventrally. On the posterior dorsal part of the body these yellow annuli disappear. In coloration and low ventral count the specimen thus approaches *alticolus* of Amaral (1931, p. 87). It has been compared with topotypes of *alticolus*, and found to differ in not having a whitish-pink belly, and in having a differently shaped head and infralabials. In these last two respects it agrees with the typical subspecies, to which it has been tentatively referred. Eventually it may prove to be a distinct southern race.

This appears to be the first record of the species from Peru.

Liophis purpurans Duméril and Bibron

Ablabes purpurans Duméril and Bibron, Erp. Gén., 7, p. 312, 1854—Mana, Cayenne.

Liophis purpurans Günther, Ann. Mag. Nat. Hist., (4), 9, p. 19, 1872.

Two male specimens, U.A. Nos. 165 and 172, without data, agree with the definition of this species. The ventrals are 145, 151, and caudals 73, 69, respectively.

Atractus badius Boie

Brachyorrhos badius Boie, Isis, p. 540, 1827—Java (in error).

Atractus badius Boulenger, Cat. Snakes Brit. Mus., 2, p. 308, 1894.

Chanchamayo, U.A. No. 113, Coronel Zapata; Madre de Dios, U.A. No. 64; montaña, U.A. No. 31, Juan Perea.

The ventrals and caudals of the two male specimens are respectively 144, 34, and 148, 33. The female specimen is fragmentary;

it has 23 caudals. In coloration Nos. 31 and 64 have the belly spotted and agree with Boulenger's type E (1894, p. 309). No. 113 is plainly his type C.

Atractus emmeli Boettger

Geophis emmeli Boettger, Ber. Senck. Ges., 1888, p. 192, fig., 1888—Mapiri River, Bolivia.

Atractus emmeli Boulenger, Cat. Snakes Brit. Mus., 2, p. 311, 1894.

One female specimen, U.A. No. 73, from the Escomel Collection, has no specific data. The ventrals are 188; the caudals 22. This specimen agrees with the original description in scaling except for the higher ventral count. It may be suspected that Boettger's specimens were males. The ventral color pattern agrees with that described by Boettger, but dorsally our specimen is much more distinctly dark-spotted. To our knowledge this is the first record from Peru.

Atractus vertebralis Boulenger

Atractus vertebralis Boulenger, Ann. Mag. Nat. Hist., (7), 13, p. 451, 1904—Santo Domingo, Carabaya, Peruvian Andes.

Two specimens with no data agree with Boulenger's description. The male, U.A. No. 148, has ventrals 170 and caudals 32. The female, U.A. No. 145, has ventrals 175 and caudals 24.

Geophis diplozeugus sp. nov.

Type from the Department of Madre de Dios, Peru. No. 40251 Field Museum of Natural History. Adult female, collected by Sr. Valdivia.

Diagnosis.—Allied to the Brazilian *Geophis poeppigi* Jan in color pattern, dorsal and ventral scale count, and other scale characters. Differing in having two temporals on each side, and a single preocular (or loreal entering the eye) about as high as long, instead of the elongate loreal of *poeppigi;* and probably in having the black rings around the body more distinct.

Description of type.—Head not wider than body, bluntly pointed; eye about equal to its distance from the labial border; body subcylindrical, tail short.

Rostral large, broader than deep, the portion visible from above about equal to the internasal suture; internasals about half as long as the prefrontals; frontal slightly broader than long, a little shorter than its distance from the end of the snout; parietals long and

with a re-entrant angle posteriorly; nasals large, completely divided, followed by a five-sided preocular which is higher than wide, and thus sharply different from the "loreal entering the eye" of *poeppigi;* a single postocular; upper labials 6, third and fourth entering the eye, the fifth much the largest and broadly in contact with the parietal; 2 temporals on each side above the sixth labial; lower labials 7; a single large pair of chin shields; widened ventrals beginning immediately behind the chin shields.

Ventrals 169; anal single; caudals 24.

General coloration dark brown above, pale yellowish beneath, with black transverse bars covering about three ventrals anteriorly and one or two posteriorly; these number 24 on the body and two on the tail. When attentively examined it is seen that these bars are widened and continued faintly in the dorsal coloration, and that posteriorly they are in tetrads, which in turn are composed of two pairs of rings. Anteriorly the arrangement in tetrads may be discerned on the sides, each of the widened bars having a light lateral spot, so that the wider ventral bar is thus apparently composed of a pair of fused bars. Individual scales black-spotted in the obscure light crossbands of the sides and back. A narrow nuchal crossband on the ends of the parietals, widening on the sides of the head; tip of snout light, including rostral, part of the internasals, and first and second labials.

Total length 430; tail 34.

Notes on paratype.—The single juvenile male paratype, U.A. No. 166, accordingly the allotype, unfortunately has no data. There can be little doubt that it came also from the Madre de Dios region. It has ventrals 162 and caudals 30, a normal sexual difference; it agrees excellently with the type in general scale characters. The posterior nasal is fused with the preocular on one side.

The coloration is more sharply defined. The first pair of black bands on the neck exhibit no division, but the next pair of bands is obscurely divided into four, and beyond this each major band is seen to be composed of two pairs of bands, widened above and tending to fuse on the back; there are ten such major "rings," with one and one-half on the tail.

Length 169; tail 17.

Remarks.—There appears to be no record of *Geophis poeppigi* other than the type, and we may be in error in our assumption that our new form is directly allied to this species. There is no inherent

difficulty in deriving the *poeppigi* color pattern from that above described. Amaral (1931, p. 87) describes *Atractus elaps tetrazonus*, from Colombia, without mention of the temporal shields. The coloration described is remarkably similar to that of *diplozeugus;* but even if Amaral overlooked the absence of the anterior temporal, as is quite unlikely, the ventral count differs significantly from that of our Peruvian species, as a second Colombian specimen referred to *tetrazonus* by Amaral (1932, p. 113) has 142 ventrals, while the original specimen had 150. *Geophis ruthveni* Werner (1925, p. 60), the only other South American species of *Geophis* (as defined by the temporal character), has 126 ventrals and an entirely different coloration.

Dipsas catesbyi Sentzen

Coluber catesbyi Sentzen, Meyer's Zool. Arch., 2, p. 66, 1796—type locality unknown.

Dipsas catesbaei Boie, Isis, p. 550, 1827.

Chanchamayo, U.A. Nos. 105, 115, 118, Coronel Zapata; Department of Madre de Dios, U.A. No. 144, Sr. Valdivia; montaña, U.A. No. 33, Sr. Juan Perea; Peru (without other data), U.A. Nos. 74, 80, 86, 95, 97, 146, 159, Escomel Collection.

This series, while showing considerable variation in labials and coloration, agrees well with the customary definition of *catesbyi.* The eight males have ventrals 181–197, caudals 88–105; four females 177–186 and 84–92.

Dipsas indica Laurenti

Dipsas indica Laurenti, Syn. Rept., p. 90, 1768—Zeylona, in error.

One male specimen, U.A. No. 114, collected by Coronel Zapata in Chanchamayo, has the dorsal scale formula 13–12–11; ventrals 209; caudals 111.

It agrees with Boulenger's definition of this species except for having 12 midbody scale rows. This is due to an abnormal loss of a row on the right side of the body. Slightly anterior to midbody there are 13 rows.

Dipsas mikanii peruanus Boettger

Leptognathus peruanus Boettger, Kat. Rept. Mus. Senck., 2, p. 128, 1898—Santa Ana, Cuzco, Peru.

One female specimen, U.A. No. 132, collected by Sr. Valdivia in Madre de Dios, agrees very well with this race except for having a

preocular and loreal entering the eye anteriorly instead of the more normal condition of the prefrontal and loreal. Ventrals 192; caudals 95.

A second specimen, U.A. No. 160, a juvenile male, without specific data, is presumably also from Madre de Dios. It agrees with the above specimen in squamation with the expected sex differences: ventrals 196; caudals 99. The vertebral row of scales is a little more expanded, but these scales are still less than twice as broad as long. In coloration, however, this specimen is quite different, for the light-colored areas between the dark crossbands are not flecked with brown, but are completely white. Similarly the ventral surface is not flecked with brown and marked with large brown spots, but is white, faintly marked with pairs of longitudinal brown streaks. This may be due to fading or to juvenile coloration. More material of the genus *Dipsas* is needed for the revisionary study that is obviously required.

Imantodes cenchoa Linnaeus

Coluber cenchoa Linnaeus, Syst. Nat., 1, p. 226, 1758—America.

Imantodes cenchoa Duméril and Bibron, Erp. Gén., 7, p. 1065, 1854.

Madre de Dios, U.A. No. 8; montaña, U.A. No. 32, Sr. Juan Perea; Peru (without other data), U.A. No. 96, Escomel Collection.

These three specimens agree well with typical representatives of the species. The two males have, respectively, ventrals 263, 265, and caudals 170; tail incomplete. The female has ventrals 258 and caudals 157.

Leptodeira annulata annulata Linnaeus

Coluber annulatus Linnaeus, Syst. Nat., 1, p. 224, 1758—America.

Leptodeira annulata annulata Amaral, Mem. Inst. Butantan, 4, p. 204, 1930.

A female specimen, U.A. No. 112, collected by Coronel Zapata in Chanchamayo, has ventrals 188, caudals 88. There is a second poorly preserved specimen, U.A. No. 117, with the same data, in the collection.

Clelia clelia Daudin

Coluber clelia Daudin, Hist. Nat. Rept., 6, p. 330, pl. 78, 1803—Surinam.

Clelia cloelia Stejneger, Proc. U. S. Nat. Mus., 45, p. 547, 1913.

Two female specimens, U.A. Nos. 28 and 77, appear to be typical. The former, from the montaña, collected by Prudencio Salazar,

has ventrals 201, and tail incomplete. The latter, without data, has ventrals 227, and caudals 72.

Oxyrhopus bitorquatus Günther

Tachymenis bitorquatus Günther, Ann. Mag. Nat. Hist., (4), 9, p. 19, 1872—Peruvian Amazon.

Oxyrhopus bitorquatus Boulenger, Cat. Snakes Brit. Mus., 3, p. 104, 1896.

A female specimen, U.A. No. 75, from the Escomel Collection, but without specific data, has ventrals 193, caudals 87, and 16 + 7 triads of black crossbands.

Oxyrhopus petolus Linnaeus

Coluber petola Linnaeus, Syst. Nat., 1, p. 225, 1758—Africa, in error.

Chanchamayo, U.A. No. 111, Coronel Zapata; Madre de Dios, U.A. Nos. 69, 121, 128, 142, Sr. Valdivia; Peru (without other data), U.A. Nos. 78, 81, 93, 154, 158, Escomel Collection.

The series is variable in coloration and may represent more than one subspecies. Nothing can be done with this problem until the revisionary study of the genus *Oxyrhopus* and its allies by Joseph R. Bailey, which is in progress, becomes available. Nos. 93 and 121 have approximately 22 + 10 yellow crossbands and thus fall between Boulenger's types A and B (1896, p. 102), with ventrals 202, 181, and caudals 66, 72, respectively. Nos. 69, 78, 128, 142, 154, 158 have 14 + 9 to 19 + 9 yellow bands and thus fall directly into Boulenger's type B. The three males have ventrals 197–209, and caudals 104–125. The three females have ventrals 205–210, and caudals 86–97. Finally, Nos. 81 and 111 have no light crossbands, or only traces posteriorly, thus agreeing with Boulenger's type C; ventrals 207, 212, and caudals 92, 100.

Oxyrhopus trigeminus Duméril and Bibron

Oxyrhopus trigeminus Duméril and Bibron, Erp. Gén., 7, p. 1013, 1854—cotypes from Rio de Janeiro and Bahia, Brazil.

A single male specimen, U.A. No. 164, without data, has ventrals 200 and caudals 81 and about 8 + 5 triads of black crossbands, somewhat irregular by being offset on the midline.

Tachymenis peruviana Wiegmann

Tachymenis peruviana Wiegmann, Nova Acta Acad. Caes.-Leop. Carol., 17, p. 252, pl. 20, fig. 1, 1835—Peru.

Trachymenis peruviana Escomel, Fauna de Arequipa, p. 9, 1929.

Arequipa, U.A. Nos. 36, 37, 39, 40; Madre de Dios, U.A. Nos. 61, 68, 70, 71, Sr. Juan Perea; Peru (without other data), U.A. Nos. 87, 89, 90, 92, Escomel Collection.

The characters of this series fall within the range of variation of this widespread and common highland species. In the six males the ventrals vary from 147 to 152; caudals from 46 to 64. In the six females the ventrals range from 141 to 151 and the caudals from 40 to 48.

As far as we know, this species has not been found in Peru below 8,000 feet and is thus apparently confined above the tropical zone. The specimens from the Madre de Dios, essentially a lowland region, therefore seem to present a problem. There is, however, a range of mountains on the southwestern side of that department from which these specimens may well have come, since the species is known to be abundant in the Urubamba and Lake Titicaca valleys.

Philodryas olfersii Lichtenstein

Coluber olfersii Lichtenstein, Verz. Doubl. Mus. Berlin, p. 104, 1818—Brazil.

Philodryas olfersii Günther, Cat. Colubrine Snakes Brit. Mus., p. 124, 1858.

Chanchamayo, U.A. Nos. 108, 119; Madre de Dios, U.A. Nos. 63, 143; Peru (without other data), U.A. Nos. 35, 84, 88; Selvas de Sandia, U.A. No. 26.

There are no differences apparent between Madre de Dios and Chanchamayo specimens. Ventrals in three male specimens range from 176 to 187 and caudals from 117 to 128; in five female specimens these characters vary from 190 to 200 and from 109 to 112.

Philodryas viridissimus Linnaeus

Coluber viridissimus Linnaeus, Syst. Nat., p. 226, 1758—Surinam.

Philodryas viridissimus Günther, Cat. Colubrine Snakes Brit. Mus., p. 128, 1858.

A single male specimen, U.A. No. 134, from Madre de Dios, has ventrals 210, caudals 121, and dorsal scales 19–19–15.

Oxybelis acuminatus Wied

Coluber acuminatus Wied, Isis, p. 667, 1824; Beitr. Naturg. Bras., 1, p. 322, 1825—Espirito Santo River, Brazil.

Oxybelis acuminatus Steindachner, Novara Expedition, Rept., p. 72, 1867.

Two female specimens, U.A. Nos. 110 and 125, are typical *acuminatus*. The former, collected in Chanchamayo by Coronel

Zapata, has ventrals 192; caudals 161. The latter, collected in Madre de Dios by Sr. Valdivia, has ventrals 198, caudals 182.

Oxybelis argenteus Daudin

Coluber argenteus Daudin, Hist. Nat. Rept., **6**, p. 336, 1803—type locality unknown.

Oxybelis argenteus Duméril and Bibron, Erp. Gén., **7**, p. 815, 1854.

One female specimen, U.A. No. 106, collected in Chanchamayo by Coronel Zapata, agrees with the definition of this form. It has ventrals 211, caudals 170, with a few of the latter missing.

Oxybelis fulgidus Daudin

Coluber fulgidus Daudin, Hist. Nat. Rept., **6**, p. 352, pl. 80, 1803—Surinam and Port-au-Prince, Santo Domingo.

Oxybelis fulgidus Duméril and Bibron, Erp. Gén., **7**, p. 817, 1854.

The collection contains one incomplete specimen, U.A. No. 150, without data.

Erythrolamprus aesculapii Linnaeus

Coluber aesculapii Linnaeus, Syst. Nat., p. 220, 1758—"Indiis."

Erythrolamprus aesculapii Duméril and Bibron, Erp. Gén., **7**, p. 845, 1854.

Three male specimens, U.A. Nos. 83, 116, 152, agree with *aesculapii* as defined by Boulenger (1896, p. 200). Nos. 83 and 152 from the Escomel Collection but without data have ventrals 197 and 191; caudals 50, and missing, respectively. No. 116, collected in Chanchamayo by Coronel Zapata, is much shriveled and was not counted. All have between 9 and 12 double pairs of black annuli on the body and tail. Thus they fit Boulenger's type E (1896, p. 202) or *tetrazona* Jan. Inasmuch as the subspecies of this form have not been clearly defined we feel it best to refer these specimens provisionally to *aesculapii*.

Tantilla marcapatae Boulenger

Homalocranium marcapatae Boulenger, Ann. Mag. Nat. Hist., (7), **10**, p. 401, 1902—Marcapata Valley, eastern Peru.

One male specimen, U.A. No. 25, from the Selvas de Sandia, is a very interesting discovery, for this species has hitherto been known only by the female type. This specimen agrees very well with the original description in both squamation and coloration, with the expected sexual differences in ventrals and caudals. These are 164

and 62 respectively as opposed to 180 and 47 in the female type. The red areas between the dark crossbands have faded to white.

Tantilla melanocephala Linnaeus

Coluber melanocephala Linnaeus, Syst. Nat., 1, p. 218, 1758—America.

Tantilla melanocephala Cope, Proc. Acad. Nat. Sci. Phila., p. 74, 1861.

Chanchamayo, U.A. No. 101, Coronel Zapata; Peru (without other data), U.A. Nos. 149, 153, 175.

In the two males the ventrals are 145 and 129; the caudals missing and 49, respectively. In the two females the ventrals are 137 and 148; the caudals 43 and missing, respectively. This series agrees with the species as redescribed by Boulenger (1896, p. 215), but the lack of differentiation of the sexes in ventrals and caudals leaves much to be explained. It appears evident that *melanocephala* is a composite form.

Micrurus balzani Boulenger

Elaps balzani Boulenger, Ann. Mus. Civ. Genova, (2), **19**, p. 130, 1898—Yungas, Bolivia.

Micrurus balzani Schmidt, Field Mus. Nat. Hist., Zool. Ser., **20**, p. 192, 1936.

A single male specimen, U.A. No. 82, without data, is referred to *balzani*, with which it agrees in style of coloration (black, yellow, and red rings not in triads) and in having a single postocular on each side. The ventrals number 196, caudals 45. The lower labials are reduced to six on each side by fusion of the normal fifth and sixth. This specimen, presumably from the Madre de Dios region, is not unreasonably distant from the hitherto known Bolivian range of *balzani*.

Micrurus hemprichii Jan

Elaps hemprichii Jan, Rev. Mag. Zool., 1858, p. 523, 1858—Colombia.

Micrurus hemprichii Amaral, Proc. U. S. Nat. Mus., **67**, Art. 24, p. 17, 1925.

A single female specimen, U.A. No. 171, is from Peru, without further data. It has ventrals 185, anal plate entire, caudals 25; triads of black rings 6 + 2/3;[1] total length 466, tail 36.

Micrurus langsdorffi Wagler

Micrurus langsdorffi Wagler, in Spix, Serp. Bras., p. 10, pl. 2, fig. 2, 1824—Rio Japura, Amazonas.

[1] The black rings, when arranged in threes, are counted as "triads," and fractions of triads, on body + tail.

A single specimen, U.A. No. 59, from the Madre de Dios region, a female, has ventrals 211, caudals 34, and 41 + 5 subequal complete black rings separated by narrow white annuli. Alternation in width of the black rings can be traced on parts of the body. It thus corresponds to *annellatus*, which the senior author has combined with *langsdorffi* (1936, p. 191).

A female specimen, U.A. No. 9, without data, is referable to this species. It has ventrals 217, caudals 31, and 21 + 7 black rings on body and tail. The black rings on the body are separated by slightly longer red zones in which the scales are heavily black-pigmented.

A specimen in the American Museum of Natural History, recorded as from Juliaca, Peru, has been examined by the senior author. Like the mammals described from Juliaca by J. A. Allen, this specimen undoubtedly came from the "Inca Mines" and thus constitutes another record from the Department of Madre de Dios.

Micrurus lemniscatus Linnaeus

Coluber lemniscatus Linnaeus, Syst. Nat., p. 274, 1758—Asia, in error.

Micrurus lemniscatus Beebe, Zoologica, 2, p. 216, 1919.

A single female specimen, U.A. No. 163, with no data, agrees well with the usual diagnosis of this species. Ventrals 228, caudals 33, black triads 9 + 1⅓, total length 340, tail 31.

We suggest the restricted type locality for this species as Belém, Pará, Brazil.

Micrurus spixii obscura Jan

Elaps corallinus var. *obscura* Jan, Icon. Gén. Ophidiens, 41, pl. 6, fig. 3, 1872 —Lima, in error.

The junior author, in the course of preparation of a list of the Peruvian snakes, finds that all of the Peruvian specimens examined agree with Jan's excellent figure of *obscura*, differing from *spixii spixii* in having an elongate black mark on the neck. This is apparently the middle black ring of the first triad of black rings. Traces of the first ring may be represented by black spots on the parietals and corresponding black spots on the gular region.

The University of Arequipa specimens, Nos. 91, 156, and 162, all without specific locality, are clearly *obscura* by this definition; the single male has ventrals 227, caudals 20, and triads ⅔, 6⅔ + ⅔. The two female specimens have ventrals 222 and 223, caudals 22 and 21, and triads ⅔, 5⅔ + ⅔, and ⅔, 7 + ⅔. The type locality for *obscura* may be corrected and restricted to eastern Peru.

Micrurus surinamensis Cuvier

Elaps surinamensis Cuvier, Regne Animal, 2, p. 84, 1817—Surinam.

Micrurus surinamensis Beebe, Zoologica, 2, p. 216, 1919.

A single male specimen, U.A. No. 131, collected in Madre de Dios by Sr. Valdivia. The ventrals number 166, caudals 33 + (tip of tail missing), total length 837, tail 97.

Trimeresurus atrox Linnaeus

Coluber atrox Linnaeus, Syst. Nat., p. 22, 1758—Asia, in error.

Trimeresurus atrox Schmidt and Andrews, Field Mus. Nat. Hist., Zool. Ser., 20, p. 182, 1936.

A single male specimen, U.A. No. 94 (without data), from Escomel Collection, has 194 ventrals and 73 caudals. In a female specimen from Madre de Dios, U.A. No. 66, ventrals and caudals are 193 and 71; another female specimen, No. 102, from Chanchamayo, has these scutes 202 and 65; and two female specimens, U.A. Nos. 147 and 151 (without data) have respectively 198 + 57, and 193 + 54. There is considerable variation in the color pattern among these five specimens, apparently all within the possible range of *atrox*.

The type locality for this form may be corrected and restricted to Surinam.

Trimeresurus microphthalmus Cope

Bothrops microphthalmus Cope, Journ. Acad. Nat. Sci. Phila., (2), 8, p. 182, 1876—between Balsapuerto and Moyobamba, Peru.

A male specimen, U.A. No. 67, from Madre de Dios, collected by Sr. Juan Perea, may be referred tentatively to *microphthalmus*. It seems not unlikely that the specimen in question may represent a new form. We reserve opinion on this matter pending examination of further material.

Trimeresurus pictus Tschudi

Lachesis picta Tschudi, Fauna Peruana, Herp., p. 61, pl. 10, 1845—higher montaña of Peru.

A single female specimen, U.A. No. 7, from the Valle de Majes, collected by Sr. Romano. Like the specimen of *microphthalmus* mentioned above, the single specimen available is insufficient basis for the description of a new form. We suspect that the population of *picta* in the Majes Valley may well be distinguishable from that of central Peru.

Crotalus durissus terrificus Laurenti

Caudisona terrifica Laurenti, Syst. Rept., p. 93, 1768—America, below lat. 45.

Crotalus durissus terrificus Klauber, Trans. San Diego Soc. Nat. Hist., 8, p. 190, 1936.

A single female specimen, U.A. No. 14, from the Selvas de Sandia, collected by Alberto Zimmermann, has 176 ventrals, anal divided, and 22 caudals. Gloyd (1940, p. 137) mentions no record of the rattlesnake from Peru except that of Tschudi (1845, p. 63), who ascribes it to the "montaña" of northern Peru, but apparently without a specimen. The junior author has heard reports of it from the Huánuco region.

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SNAKES OF THE PERUVIAN COASTAL REGION

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The Andes divide Peru into three regions familiar to every Peruvian as the "costa," the "sierra," and the "montaña." These regions, the desert coast with its numerous oases formed by the transecting valleys; the sierra with its high plateaus and mountain ridges extending far above snow line; and the tropical forest region of the deep valleys and of the connected Amazonian lowland east of the mountains, are in fact the major phytogeographic and zoogeographic divisions of Peru. The herpetological fauna of the highland is extremely limited, with only a single species of snake, *Tachymenis peruviana,* traceable above 12,000 feet, together with a common lizard and a few frogs and toads. The tropical lowland has the rich and complex fauna of the Amazon Basin, further complicated by the forms proper to the cloud forest zone at intermediate altitudes on the eastern side of the Andes. In this region much collecting remains to be done before an adequate study can be made even of creatures as relatively conspicuous as the snakes. The snake fauna of the coastal region, though somewhat impoverished in species, is of great interest, since the species and subspecies are with few exceptions endemic. In view of the relative simplicity of the coastal fauna, and with the accumulation of considerable collections from coastal Peru in Field Museum and in the Museum of Comparative Zoology, we feel that a review of the snakes of this faunal region may be a useful preliminary to further studies on the amphibians and reptiles of Peru.

In addition to a summary of the literature and an attempt to disentangle the nomenclature of the coastal forms, we here report

on two considerable collections from the Peruvian coast. The first of these was assembled by Dr. Axel A. Olsson while stationed at Negritos as geologist for the International Petroleum Company, with some increments from Mr. E. W. MacCormack, and more recently from Mrs. Harriet Frizzell, also of Negritos. The second consists of an accumulation of preserved snakes presented to Field Museum's Magellanic Expedition by Sr. Constante Larco Hoyle on the occasion of a visit of the senior author to the Hacienda Chiclin (north of Trujillo) in 1939. A few additional specimens from the coastal region were received from other sources as results of the continued interest of Mr. Colin C. Sanborn, also of the Magellanic Expedition of 1939. Mr. Sanborn collected at Chucurapi, the hacienda of the Romana family near Mollendo, in 1939, and in the little-known Ica region in 1942. A single small snake of the genus *Leptotyphlops* was presented by Mr. Bruce A. Hertig, of Lima, with several other additions to the collection from Dr. Marshall Hertig, of the Instituto Nacional de Higiene y Salud Pública, in Lima.

The collections of snakes lent to Field Museum for study by the University of Arequipa have been reported upon by the present authors. This collection makes available a considerable number of specimens from the southern portion of the coastal region of Peru. Finally, the junior author has had the advantage of examining all of the Peruvian collection at the Museum of Comparative Zoology, a collection which has been augmented recently by specimens received from Mr. W. F. Walker, Sr., of Oroyo, Peru, and from Messrs. J. A. Griswold, Jr., and G. P. Gardner, obtained on their expeditions to Peru.

The coastal region of Peru may be defined for the purpose of the present paper as the coastal drainage extending from the Ecuadorean border to Chile, and from the Pacific coast to the crest of the western cordillera. The Catamayo Valley, extending into the Ecuadorean Department of Loja, the low passes of the Cordillera Occidental in Cajamarca at the north, and the southwestern continuation of the coastal desert into Chile, make necessary some consideration of these outlying areas in the discussion of various species in our list.

The Hispanic Map published by the American Geographic Society indicates that there are three passes over the western cordillera near the Ecuadorean border of Peru somewhat below 10,000 feet elevation, and various passes between coastal Piura and Lambayeque and Andean Cajamarca at less than 8,000 feet. These passes apparently explain the presence of some non-endemic

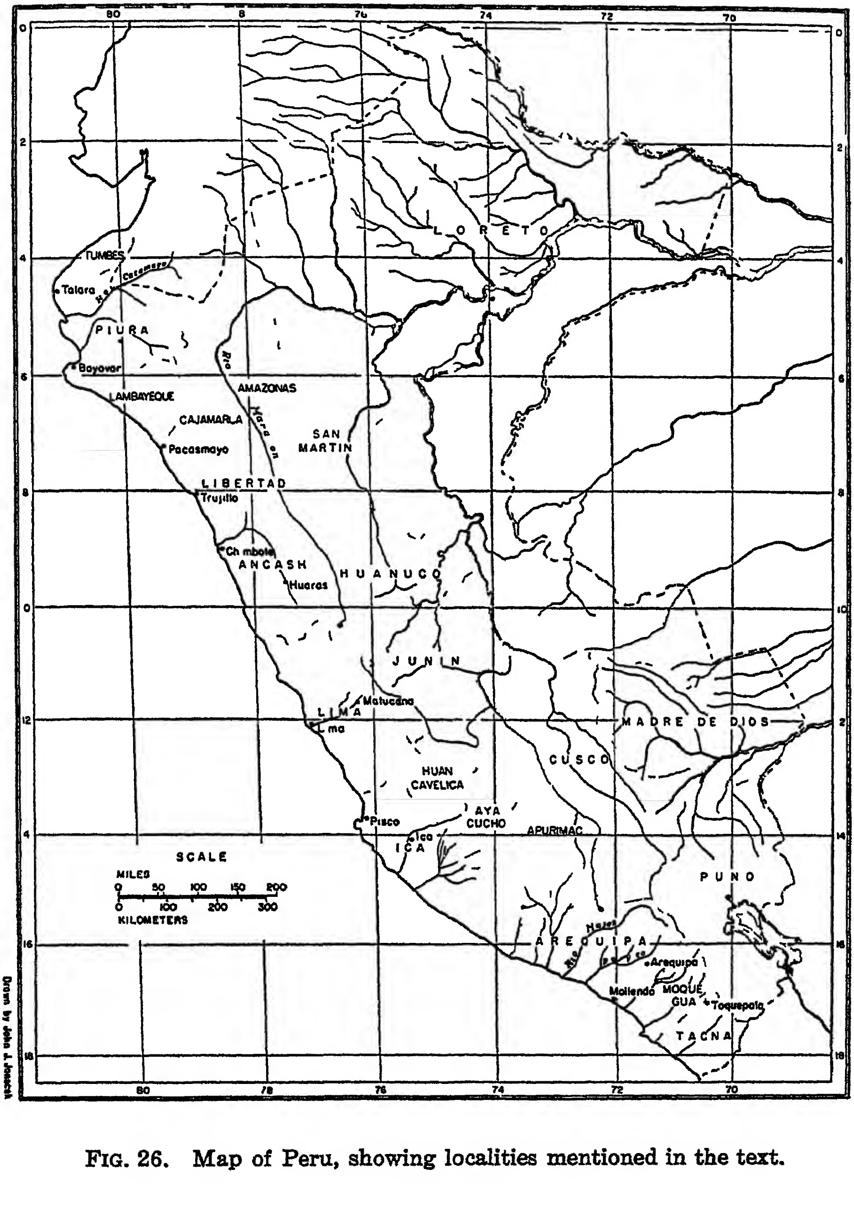

FIG. 26. Map of Peru, showing localities mentioned in the text.

forms of Amazonian or Ecuadorean origin in the northern part of the coastal area and also throw light on the transgression of certain elements of the coastal fauna into the arid northern portion of the Marañon Valley. Farther south the passes are at fourteen to sixteen thousand feet, well above the altitude reached by any species of the coastal fauna proper. This stupendous mountain barrier is not again transgressed by reptiles of the lowland east of the Andes until, at the south, the lake region of southern Chile again provides passes at low altitude.

The Peruvian coastal region is one of the most barren areas in the world, much of it rock and sand desert, extending for miles without visible plant or animal life. It contrasts strongly with the Sonoran desert in southwestern North America, familiar to North American biologists, with its wealth of conspicuous plants and animals adapted to desert conditions through age-long evolution. Our Sonoran desert is literally the headquarters of the reptilian fauna of a continent, with numerous forms exhibiting remarkable and extreme adjustment to desert conditions. In the Peruvian desert, the reptiles form a mere appendage to the rich reptilian fauna of South America as a whole, and in spite of the endemism of numerous species, it seems clearly to be a recent desert, in which there has not been time for the evolution of specifically xerocole types.

The most remarkable botanical feature of coastal Peru, the rich seasonal flora of the "lomas," which depends on concentration of the coastal fogs in certain slopes and in certain valleys, appears to have no associated amphibians or reptiles. There are considerable botanical differences between the Piura region and the coastal desert farther to the south. The most useful account of the phytogeography of Peru appears to be that of Weberbauer (1922, 1936).

Much of the interest of the Peruvian coastal fauna and flora lies in its linear extent from north to south; the biota is richest in Piura at the north, becoming gradually impoverished to the south, where the coastal plain is all but pinched out between the mountains and the sea in northern Chile. In this region only a minimum of land life persists. To the south of Antofagasta, a scrub vegetation develops, essentially with only an impoverished desert fauna. The characteristic Peruvian lizard *Tropidurus peruvianus* persists on the coastal strip and the common highland snake of Peru (*Tachymenis peruviana*) descends to low altitudes in central Chile. In southern Chile, where the humid evergreen forest begins, there is a radical faunal change, with numerous endemic genera of frogs,

though none of snakes. It is evident, even from our necessarily limited studies, that a systematic survey of the coastal fauna through its 2,500-mile range from north to south would disclose numerous variation clines, the establishment of which is necessary to any definitive taxonomic arrangement of the elements composing the fauna.

LIST OF LOCALITIES

The localities mentioned in the text are shown on the accompanying map. A list of the coastal localities from which specimens have been examined follows:

Arequipa: The vicinity of Arequipa, capital of the Department of Arequipa, elevation 7,500 feet. Arid slopes, a semi-desert except in irrigated valley bottoms.

Bayovar: A port on the southern shore of the Bahia de Sechura, Department of Piura.

Cajamarquilla: Adobe ruins in the Rimac Valley a few miles inland from Lima, Department of Lima. Matted bromeliad vegetation.

Chiclin: A sugar-producing hacienda between Trujillo and Chicama, Department of Libertad. Irrigated cane fields and pastures, surrounded by sandy desert toward the coast and by stony pavement desert farther inland.

Chimbote: A port near the mouth of the Rio Santa at the northern boundary of the Department of Ancash.

Chongollapi: A village at the desert border in Piura.

Chosica: A resort town above Lima, in the Rimac Valley, at an elevation of 2,800 feet, Department of Lima.

Chucurapi: A sugar hacienda near Mollendo, in the Department of Arequipa.

Ica: A considerable metropolis inland from the port of Pisco, in a broad alluvial valley.

Jequetepeque: A valley in the Department of Libertad, entering the sea near Pacasmayo.

Lima: Capital of Peru, Department of Lima, on the irrigated alluvial plain of the Rimac River.

Majes Valley: A long, well-watered valley north of the Vitor Valley, Department of Arequipa.

Negritos: A port in northern Piura just south of Talara.

Pacasmayo: The port of entry for Cajamarca in the northern part of the Department of Libertad.

Quebrada Montero: An arroyo in the oil-field region, Department of Piura.

Quebrada Parinas: An arroyo emptying into the ocean at Parinas just south of Negritos, Department of Piura.

Quebrada Paxul: An arroyo in the oil-field region, Department of Piura.

Quebrada Sal Grande: An arroyo in the oil-field region, Department of Piura.

Quebrada Seca: An arroyo in the oil-field region, Department of Piura.

Surco: A small town at an elevation of about 6,000 feet, in the Rimac Valley below Matucana, Department of Lima.

Talara: The port and headquarters of the International Petroleum Company, Department of Piura.

Tambo: A small town on the Rio Tambo, in the southern part of the Department of Arequipa.

Toquepala: A mining camp at an elevation of 8,000–10,000 feet, east of the city of Moquegua, Department of Tacna.

Vitor Valley: A valley crossing the coastal desert of the Department of Arequipa below Arequipa.

Other localities from which specimens have been examined include especially Perico, the Rio Marañon, and Bellavista, in the Marañon Valley (eastern Cajamarca), where the late G. K. Noble made collections for the Museum of Comparative Zoology in 1916.

Specimens of coastal species in the collections of the University of Arequipa recorded as from "Selvas de Sandia" and "Madre de Dios" appear to bear erroneous data (Schmidt and Walker, 1943, p. 284).

Serpentes

Leptotyphlopidae

Leptotyphlops rufidorsus Taylor

Leptotyphlops rufidorsum Taylor, Univ. Kans. Sci. Bull., 26, p. 533, fig. 2, 1940—Lima, Peru.

A medium-sized *Leptotyphlops*, without cephalic or caudal spots, with a median dorsal brownish band covering three scale rows and the adjacent half scale rows; dorsal scales about 260.

Known only from the type locality and from Chiclin, Libertad, as here reported, thus possibly characteristic of the central portion of the desert region.

A single specimen, No. 34305, from Chiclin, Libertad, has dorsal scales 256, caudals 16, scales around body 14, around mid-tail 10; length 241, tail 12; diameter of body contained in total length about 40 times. Supraocular and labial separating rostral from ocular on both sides. Coloration in close agreement with Taylor's description.

We have read Werner's description of *Glauconia albifrons* var. *rubrolineata* (Werner, 1901, p. 6), said to be from Lima, with attention. It does not appear to refer to any of the species here recorded, and, as remarked below (p. 313), the type locality may well be erroneous.

Leptotyphlops subcrotillus Klauber

Leptotyphlops subcrotilla Klauber, Trans. San Diego Soc. Nat. Hist., 9, pp. 59–66, fig. 2, 1939—Grau Tombes, northern Peru [=Grau, Tumbez].

A small slender worm snake of the *albifrons* group, with a white spot on the rostral and on the caudal spine; dorsal scales from rostral to tail spine about 330.

Known only from the type locality and from Chiclin, Libertad, as here reported, thus apparently ranging through the northern desert region.

Two specimens, Nos. 34267 and 34304, from Chiclin, Libertad, agree excellently with Klauber's description. The dorsal scales number respectively 325 and 324; scale rows 14; scales around mid-tail 10; total length and tail length 137 and 6, and 184 and 8; diameter of body contained in total length 70 to 90 times.

Leptotyphlops melanurus sp. nov.

Type from Chiclin, Libertad, Peru. No. 34269 Field Museum of Natural History. Presented to Magellanic Expedition of Field Museum, November, 1939, by Sr. Constante Larco Hoyle.

Diagnosis.—A small slender worm snake, nearly uniform in coloration, not distinctly lineate; no caudal spot, rostral spot occasionally present; dorsal scales 395; ocular shield in contact with the nasal.

Description of type.—Body slender, head very little widened, tail about three times as long as its diameter, ending in a small spine-bearing scale. Snout rounded, projecting.

Rostral narrowed posteriorly, extending backward barely to the eye; upper portion of nasal considerably larger than lower; ocular broadly in contact with nasal; ocular widest at eye-level, eye distinct, at anterior border of ocular supraoculars wider than long, posterior larger than anterior, both larger than the median series of scales; third scale of median series largest, followed by a narrower scale with a small scale on each side, while the fifth scale is wider, though not longer, than the third; scales following the fifth gradually narrowed to the uniform mid-dorsal series; parietals about as wide as posterior supraoculars; chin shields small.

The scales are in 14 rows throughout the length of the body, 10 around the middle of the tail. Dorsal scales from rostral to caudal spine 395; caudals 18.

General color brown, a little lighter beneath, the outlines of the scales lighter; a light spot on the rostral, none on the tail; upper head shields all with light pores.

Measurements of type.—Length 135; tail 6; diameter of body 2.

Notes on paratype.—The single paratype, No. 34268, obtained with the type at Chiclin, measures only 91 mm., tail 5. It agrees almost exactly with the type, with dorsal scales 396 and caudal 20.

Range.—Known only from type locality.

Leptotyphlops tessellatus Tschudi

Typhlops tessellatum Tschudi, Fauna Peruana, Herp., p. 46, 1845—Lima.

Two specimens of a small *Leptotyphlops* of the *albifrons* type from Lima may be referred with little hesitancy to Tschudi's species. One of these was collected and presented by Mr. Bruce A. Hertig, the other was collected in the wall of an old adobe house in Lima by Mr. Felix Woytkowski, a well-known collector of Peruvian insects. *Leptotyphlops tessellatus* is here redescribed in some detail for comparison with recent descriptions of species of this genus.

Diagnosis.—A small worm snake with lineate pattern, darker on the upper half of the body, and with white spot present on rostral and tail spine. Ocular separated from nasal by supraocular and labial; dorsal scales about 260.

Description (No. 35097).—Body slender, head scarcely wider than body, tail three and one-half times as long as its diameter, ending in a rather large pointed scale. Snout rounded, projecting.

Rostral sharply narrowed posteriorly, extending backward barely to the level of the eye; upper and lower portions of nasal subequal; ocular separated from nasal by a contact of the supraocular with the first labial; eye distinct at upper anterior corner of the ocular; anterior supraoculars a little smaller than posterior, directed obliquely forward and outward; posterior supraoculars about equal to parietals; median scales very narrow, fifth behind rostral widest.

The scales are in 14 rows throughout; 10 scales around middle of tail. Dorsal scales from rostral to tail spine 261; caudals 17.

General color brown, lighter on the edges of the scale rows, producing a lineate appearance; seven dorsal rows darker than the seven ventral; a light spot on the rostral and lower portions of the nasals, and one covering the entire tail spine and two adjacent

scales; upper head shields all with light pores. Length 90; tail 5; diameter of body 2.

The second specimen in our collection (No. 36726) measures 102; tail 6; diameter of body 2. It has 262 dorsal scales from rostral to tail spine.

Range.—Known only from the coastal area of north-central Peru near Lima.

Remarks.—There appears to be no doubt that the *Leptotyphlops albifrons* of authors is an omnium gatherum of species of varying degrees of distinctness. In view of the generally endemic nature of the Peruvian coastal fauna, it is extremely unlikely that true *albifrons*, an Amazonian species, should occur there. It is nevertheless surprising that four fully distinct species of *Leptotyphlops* should occur in this faunal area.

The reference of the present form to *tessellatus* is based primarily on the fact that the type locality is Lima, where Tschudi obtained three specimens from houses, so that it appears to be reasonably abundant. Darwin obtained a specimen from Lima, recorded by Boulenger (1893, p. 36), which presumably belongs here, as may a specimen from Chimbote reported by Cope (1877, p. 35).

Boidae

Constrictor constrictor ortonii Cope

Boa ortonii Cope, Proc. Amer. Phil. Soc., 17, p. 35, 1878—Chilete, near Pacasmayo.

Constrictor constrictor Dunn, Proc. Biol. Soc. Wash., 36, p. 186, 1923—Perico and Rio Marañon.

A medium-sized boa constrictor, pale in coloration in association with its desert habitat, related to *C. c. imperator* in the relatively low number of dorsal scale rows. It differs from *imperator* of Central America and northwestern South America in having a higher number of ventrals and in its lighter and more sandy ground color.

The range of *C. c. ortonii* appears to extend from Perico and the upper Marañon Valley to Piura and south to Libertad, in the arid region of northwestern Peru.

The two specimens in Field Museum, No. 8360, from Parinas Valley, Piura, and No. 34301, from Chiclin, Libertad, are both males, with dorsal scales 57–62 at mid-body, ventrals 250–251, and caudals 46–55. The five specimens collected by the late G. K. Noble for the Museum of Comparative Zoology, Nos. 17664 and

18960, from Perico, and Nos. 18977–18979 from the Rio Marañon, include three males and two females. The total ventral range in males is 246–252, and caudals 46–59. In two females, the ventral range is 246–248, caudals 49–51. The maximum of dorsal scale rows in both sexes is 72.

The separation of the orbital scales from the labials in the type, thought by Cope to distinguish this form, holds in several of our specimens, but is not diagnostic.

Colubridae[1]

Dryadophis boddaertii heathii Cope

Drymobius heathii Cope, Journ. Acad. Nat. Sci. Phila., 8, p. 179, 1876—Valley of Jequetepeque; Proc. Amer. Phil. Soc., 17, p. 34, 1877.

Herpetodryas boddaertii var. *heathii* Boettger, Ber. Senck. Ges., 1889, p. 313, 1889.

Dryadophis heathii Stuart, Misc. Publ. Mus. Zool. Univ. Mich., 49, p. 77, 1941.

The common *Dryadophis* of the Peruvian coastal region is a medium-sized grayish-colored ground snake, with a light lateral stripe on each side. It is distinguishable from the race *D. b. boddaertii* of the Amazon Basin by the position of the lateral stripe on scale rows 4, 5, and 6 anteriorly and 3, 4, and 5 posteriorly, instead of on 4 and 5 only. The young are crossbarred.

The subspecies *heathii* is confined to the Peruvian coastal region, ranging from Libertad to Lima and from sea level to at least 6,000 feet altitude.

The specimens examined in Field Museum collections are No. 5706, from Pacasmayo, collected by W. H. Osgood and M. P. Anderson in 1912; Nos. 34283, 34296–34299, 34312, and 34316–19, from Chiclin; and No. 38108, collected at Surco, and presented by Dr. Marshall Hertig.

In this series, four male specimens have ventrals 176–185 and caudals 103–107; five females have ventrals 189–192 and caudals 103–108, thus altering Stuart's diagnosis of *heathii* by a slight lowering of the range of caudals and a considerable lowering of that of the ventrals. This is not surprising, in view of the small number of specimens of this form previously available. The color-

[1] Jan's record of *Rabdosoma badium multicinctum* (Icon. Gén. Ophid., Livr. 10, pl. 4, fig. 5, 1865), from Lima, is not included. It is doubtless based on a transported specimen.

ation of the under surface is not always immaculate; it may be dotted with gray, and the limit of the encroachment of the dorsal ground color upon it is faintly marked by a narrow whitish line on each side. These changes tend to reduce the differences between *heathii* and *boddaertii*, and we have accordingly placed *heathii* as a race of *boddaertii*.

The series before us includes four specimens from Chiclin with the typical juvenile crossbarred coloration of the *boddaertii* group (Stuart, 1941, p. 21). A fifth specimen, No. 38108, a male, from Surco, Lima, taken at an altitude of 6,000 feet, measures only 275 mm. in body length, but has no trace of the juvenile markings. We agree with Stuart (l.c., p. 73) in suspecting that there may be a dwarfed Andean race, or that both *b. heathii* and *b. boddaertii* may be dwarfed at altitudes above their normal range.

Stuart (l.c., p. 70) reports a specimen from Huaraz, in the coastal drainage, as *boddaertii boddaertii*. On geographic grounds, we question this allocation of the specimen.

Drymarchon corais melanurus Duméril and Bibron

Spilotes melanurus Duméril and Bibron, Erp. Gén., 7, p. 224, 1854—Mexico.

Spilotes pullatus dichrous Dunn, Proc. Biol. Soc. Wash., 36, p. 186, 1923 (not of Peters, part).

Drymarchon corais melanurus Ruthven, Misc. Publ. Mus. Zool. Univ. Mich., 8, p. 65, 1922; Parker, Ann. Mag. Nat. Hist., (11), 2, p. 443, 1938.

Drymarchon corais melanurus is a large terrestrial snake, characterized by black coloration on the head and neck and on the posterior part of the body and tail, with the dorsal scales in slightly oblique rows.

Its presence in coastal Peru rests on the somewhat dubious record from Chongollapi, Piura (Dunn, 1923, p. 186), but further records from the Catamayo Valley in Ecuador (Parker, 1938) make its occurrence in the arid coastal region probable.

We do not find characters to differentiate this form from the Mexican and Central American *melanurus*, but it is evident that the Peruvian and Ecuadorean population affords a taxonomic problem, especially in view of the various races of *corais* in Mexico demonstrated by Smith (1941, p. 466). The Chongollapi specimen has 214 ventrals and 75 caudals. It apparently represents the southern extreme of a trend toward lower numbers of ventrals, which has been pointed out by Smith.

We are not convinced of the desirability of nomenclatural changes on the grounds offered by Smith (1941, p. 474); see Harper (Copeia, 1942, p. 180) for the contrary argument. It is evident that a malevolent person, applying the interpretation of the rules as followed by Smith, could upset a very large proportion of current names.

Dromicus angustilineatus sp. nov.

Dromicus chamissonis Schmidt and Walker, Field Mus. Nat. Hist., Zool Ser., 24, p. 283, 1943 (in part, not of Wiegmann).

Type from Toquepala, Tacna, Peru. No. 45908 Museum of Comparative Zoology. Adult male, collected in April, 1938, by W. F. Walker, Sr.

Diagnosis.—A *Dromicus* allied to *chamissonis* of coastal Chile, but with ventrals 204–217 (maximum known in *chamissonis* 200) and with a narrow dark mid-dorsal line instead of the wider band of the Chilean form.

Description of type.—Form of body typically colubrid; rostral broader than deep, just visible from above; internasals shorter than prefrontals; frontal twice as long as broad, longer than its distance from the tip of the snout, as long as the parietals; supraoculars nearly as wide as the frontal; nasal divided; loreal longer than deep; preocular single, reaching the upper surface of the head, but not in contact with the frontal; 2 postoculars on each side; temporals 1–2 on each side; upper labials 8, fourth and fifth entering the eye; lower labials 10, six in contact with the chin shields; posterior chin shields longer than the anterior; dorsal scales smooth, with single apical pits, scale reduction formula 19–17–15, the scale rows at mid-body 19; ventrals 204; anal divided; caudals 111.

Posterior maxillary teeth enlarged. Hemipenis bifurcate, with bifurcate sulcus and with tips of the bifurcations calyculate.

A mid-dorsal dark line three scales wide on the nape soon narrowing to the width of the mid-dorsal scale row; a light gray band extending to the fifth scale row, bounded below by a sharply marked though somewhat interrupted black line on the middle of that scale row; a more obscure dark line along the middle of the light gray band; darker gray on the sides, merging below into the lighter ventral color; head brownish above, with a dark streak from the rostral through the eye and across the temporals to become continuous with the lateral darker gray band.

Notes on paratypes.—In addition to M.C.Z. No. 45907 from the type locality, we have examined six specimens in the collection of the University of Arequipa (Schmidt and Walker, 1943, p. 283), of which four have now been accessioned by Field Museum as Nos. 40035–40038. Three of these, F.M.N.H. Nos. 40037–40038 and U.A. No. 141, are said to be from Madre de Dios, in Amazonian Peru; this we regard as a mistake caused by confusion of data. The remaining paratypes are from Tambo, F.M.N.H. No. 40035; from the vicinity of Arequipa, F.M.N.H. No. 40036; and from the Vitor Valley, U.A. No. 10. This series of specimens, though much faded from exposure to light, agrees well with the type. Two have 21 scale rows on the neck; one has upper labials 7–8, and one has upper labials 9–9; anterior temporals 2 in two specimens; four males have ventrals 195–204, caudals 111–125; three females have ventrals 205–217 and caudals 110–111. The narrow black lines of the back tend to be broken into series of spots, but are distinct in six paratypes; in M.C.Z. 45907 they have disappeared entirely.

Measurements.—Type 584; tail 161. Largest female (U.A. 10) 891; tail 280.

Range.—Southwestern Peru, from near sea level to about 10,000 feet.

Remarks.—It seems evident that *Dromicus angustilineatus* is directly related to *D. chamissonis* of Chile, which it replaces in southern Peru, and from which it differs in its higher number of ventrals, and in the narrow dorsal line, instead of the broad dorsal band of the Chilean species.

Dromicus tachymenoides sp. nov.

Type from Chucurapi (near Mollendo), Department of Arequipa, Peru. No. 34261 Field Museum of Natural History. Adult female, collected in October, 1939, by Colin C. Sanborn.

Diagnosis.—A *Dromicus* allied to *D. chamissonis* of Chile and to *angustilineatus* described above; differing from the former in its higher number of ventrals (202–220) and from the latter in having a spotted coloration, without longitudinal lines and bands.

Description of type.—A snake of typical colubrid proportions; rostral nearly as deep as broad, visible from above, internasals shorter than the prefrontals, frontal nearly twice as long as broad, a little longer than its distance from the end of the snout, and nearly as long as the parietals; supraoculars large, as wide as the

frontal posteriorly; nasal divided; loreal nearly twice as long as deep; preocular single, extending to the upper surface of the head, not in contact with the frontal; 2 postoculars; temporals 2–2 on each side; supralabials 10 on the left side, fifth and sixth entering the eye, 8 on the right, fourth and fifth entering the eye; several labials horizontally divided; lower labials 11–13, 7 and 6 in contact with the chin shields. Dorsal scales smooth, with single apical pit, scale rows 19 at mid-body, 23 immediately behind the head, full formula 23–21–19–17–15; ventrals 202, anal divided, caudals 107.

Posterior maxillary teeth enlarged, not grooved.

General coloration light gray (superficial epidermis lacking), with black punctulation on most scales; two parallel rows of paired black or dark gray spots along the back, the pairs uniting anteriorly to form transverse bars on the neck; venter mottled gray and yellow. Head brownish gray above, with a dark gray band from the rostral through the eye to the neck, not in contact with the anterior dark crossbars; labials and chin yellowish, slightly mottled with gray.

Measurements.—Total length 1,055; tail 300.

Notes on paratypes.—Two paratypes received from the University of Arequipa agree excellently with the type in scale and color characters. Both are females; F.M.N.H. No. 40033 is without data; U.A. No. 15 is said to be from the "Selvas de Sandia," a locality that we regard as an error in labeling. The former specimen has ventrals 220, caudals 106; in the latter the ventrals can not be counted; it has caudals 102. The edges of the ventrals are dotted with black in both specimens. A third paratype, M.C.Z. 45940, is from Toquepala. It agrees in coloration but has a somewhat broader rostral, longer frontal, and shorter loreal than the type; it has ventrals 216, and caudals 95.

Range.—Known only from southern coastal Peru, where it occurs together with *angustilineatus*, from sea level to ten thousand feet altitude.

Remarks.—It will be seen that the numbers of ventrals and caudals in *tachymenoides* are little different from those in *angustilineatus;* the species appears to be adequately distinguished by its spotted and crossbarred color pattern, which bears a general resemblance to that of *Tachymenis peruviana.* It is obvious that the range and habitat of *Dromicus angustilineatus* and of *D. tachymenoides* afford unsolved geographic problems.

Boigidae

Leptodeira larcorum sp. nov.

Sibon annulatum (not of Linnaeus) Cope, Proc. Amer. Phil. Soc., 17, p. 33, 1877—Chimbote Valley.

Leptodeira annulata Dunn, Proc. Biol. Soc. Wash., 36, p. 186, 1923.

Type from Chiclin, Libertad, Peru. No. 34302 Field Museum of Natural History. A male specimen, presented to the Magellanic Expedition of Field Museum by Sr. Constante Larco Hoyle, in 1939.

Diagnosis.—A *Leptodeira* resembling *L. rhombifera* of Central America and northwestern South America in having vertebral and paravertebral scale rows little if at all enlarged, and thus differing from *L. annulata annulata;* differing from *rhombifera* in having a higher number of ventrals, 175–184 versus 158–178, and caudals, 78–91 versus 64–84, and in the strong tendency for the dorsal spots to fuse into a zigzag line (in the latter respect resembling *annulata annulata;* Dunn, 1936, p. 691).

Description of type.—A snake with large head, distinct from the neck, with a large eye; body slightly compressed. Rostral much broader than high, scarcely visible from above; internasals shorter than the prefrontals; frontal one-third longer than broad, as long as its distance from the end of the snout, shorter than the parietals; nasal divided; loreal slightly longer than high; a large preocular, in contact with the frontal; a small inferior preocular formed by division of the third labial; 2 postoculars; temporals 1–2, with a small additional anterior temporal cut off from the seventh labial; upper labials 8, the fourth and fifth entering the eye; lower labials 10, six in contact with the chin shields; posterior chin shields slightly longer than anterior; dorsal scales smooth, simplified formula 19–21–15; ventrals 184, anal divided, caudals 91.

Head grayish brown with a butterfly-shaped darker marking on the parietals and occiput, and a dark band from snout to angle of mouth; grayish brown above, with alternating paravertebral blotches that tend to fuse into a zigzag dorsal band; a lateral row of alternating spots, with still smaller spots on the first and second scale rows; lateral spots disappearing on the tail; uniform yellow beneath, with faint brown markings on the chin and lower labials.

Measurements of type.—Total length 630; tail 172.

Notes on paratypes.—Twenty-three specimens in addition to the type are referred to this species: F.M.N.H. Nos. 34306–34311, from the type locality, presented by Sr. Constante Larco Hoyle; M.C.Z. Nos.

17412–17416 from Perico, and 17454–17465 from Bellavista, collected by G. K. Noble in 1916. In this series, in excellent agreement with the type in coloration, the preocular is in contact with the frontal in about half the specimens, and several agree with the type in the presence of a small lower preocular, and in the small supernumerary anterior temporal.

There is some geographic variation in the caudals in females, not discernible in the smaller series of males, as shown below:

	Number of specimens	Sex	Ventrals	Caudals
Coastal series	3	♂	178–184	88–91
	3	♀	183–188	75–82
Cajamarca series	2	♂	178–182	89–91
	10	♀	175–184	78–84

The largest paratype, F.M.N.H. No. 34306, measures 905; tail 204.

Range.—Northern coastal Peru, extending into the arid parts of the Marañon Valley.

Remarks.—The new form is named for the brothers Rafael, Constante, and Xavier Larco Hoyle, who together manage the Hacienda Chiclin, where their régime is characterized by modern and ingenious agricultural methods, social consciousness, and a wide interest in general science. Thus it was not an accident that they should have accumulated the considerable collection of snakes presented by them to the Magellanic Expedition of Field Museum and here reported upon.

Oxyrhopus fitzingeri fitzingeri Tschudi

Siphlophis fitzingeri Tschudi, Fauna Peruana, Herp., p. 56, pl. 8, 1845—coast of Peru.

Oxyrhopus fitzingeri Jan, Elenco Syst. Ophid., p. 93, 1863; Icon. Gén. Ophid., Livr. 35, pl. 5, fig. 1, 1870; Boulenger, Cat. Snakes Brit. Mus., 3, p. 108, 1896; Werner, Abh. Mus. Dresden, 9, No. 2, p. 8, 1900 (part).

Pseudoboa fitzingeri Amaral, Proc. U. S. Nat. Mus., 67, art. 24, p. 12, 1925 (part)—Verrugas Canyon.

Oxyrhopus fitzingeri fitzingeri is a medium-sized snake with the strong musculature of a constricting species, characterized by singularly irregular dark brown markings on a yellowish ground color. These spots may cover only a single scale, or may be confluent into blotches or zigzag lines. It is distinguished from its northern subspecies (described below) by a much higher number of ventrals and

caudals. It is a common snake of the arid coastal region from sea level to at least 6,000 feet altitude in the Rimac Valley.

We have examined a single specimen in Field Museum, No. 34361, from Surco, collected by Marshall Hertig in 1938. This specimen, a female, has ventrals 227 and caudals 94; by division of anterior labials, there are 10 upper labials on each side; preoculars 2 on the left, 1 on the right side; length 714, tail 157.

Search of the literature discloses two additional female specimens from the Rimac Valley or presumably so, and these agree with our Surco specimen and with the type in number of ventrals. In the type the ventrals number 236 and caudals 77, and it undoubtedly is a female; the specimen recorded by Boulenger has ventrals 232 and caudals 81; and one from Verrugas Canyon (see Hertig, 1942, pt. III, p. 24 and pl. 1), collected by C. H. T. Townsend, has ventrals 227 and caudals 79. The senior author has elsewhere called attention to the confusion of data in the Dresden Museum collection reported upon by Werner (1901). Much of the Chanchamayo material in the collection undoubtedly was received from the Chanchamayo near La Merced in the Department of Junín, the residence of Carlos Schunke, a dealer in museum specimens; but this could scarcely have been the locality where *Oxyrhopus fitzingeri* and *Micrurus tschudii* were collected. Such confusion of data in collections received from foreign correspondents is a not infrequent occurrence. The Dresden collection includes specimens with both high and low numbers of ventrals; but as these are not sexed they cannot be assorted, even arbitrarily, to the two subspecies of *fitzingeri*.

Oxyrhopus fitzingeri frizzelli subsp. nov.

Oxyrhopus fitzingeri Cope, Journ. Acad. Nat. Sci. Phila., **8**, p. 177, 1876—Jequetepeque; Proc. Amer. Phil. Soc., **17**, p. 33, 1877—Chimbote; Boettger, Ber. Senck. Ges., **1889**, p. 314, 1889—Pacasmayo; Peracca, Bol. Mus. Zool. Torino, **19**, No. 465, p. 14, 1904—Puntilla Santa Elena, Ecuador.

Clelia fitzingeri Dunn, Proc. Biol. Soc. Wash., **36**, p. 186, 1923—Chongollapi, Piura, Peru.

Pseudoboa fitzingeri Amaral, Proc. U. S. Nat. Mus., **67**, Art. 24, p. 12, 1925—part, Piura; Parker, Ann. Mag. Nat. Hist., (11), **2**, p. 444, 1938—Catamayo Valley, Ecuador.

Type from Negritos, Piura, Peru. No. 35997 Field Museum of Natural History. A male specimen, collected in 1939 and presented by Harriet E. and Don L. Frizzell.

Diagnosis.—An *Oxyrhopus* with the typical *fitzingeri* coloration, but with a much lower number of ventrals, 202–207 in females, contrasted with 227–236 in four female *fitzingeri;* and of caudals 57–69 instead of 77–94.

Description of type.—A relatively slender snake with small pointed head scarcely distinct from the neck. Rostral wider than high, well visible from above; internasals much smaller than prefrontals, their suture less than half that of the prefrontals; frontal a little longer than wide, shorter than the parietals; loreal twice as long as high; preocular single, widely separated from the frontal, postoculars 2 on each side; upper labials 8–8, the fourth and fifth entering the eye; lower labials 9–9.

General ground color pale yellow, the venter and lowermost scale rows immaculate; back heavily and irregularly marked with dark brown spots, mostly following scale outlines; top of head mottled with dark on a paler brown ground color; a solid dark brown nuchal mark nearly as long as the head.

Measurements of type.—Total length 647; tail 131.

Notes on paratypes.—Six paratypes are available for the establishment of *O. f. frizzelli:* An additional specimen, No. 35998, collected by V. J. Molonoy and Don L. Frizzell at the mouth of the Quebrada Paxul, Amotape Mountains, Piura; No. 5665, collected by M. P. Anderson at Chimbote, Ancash, in 1912; No. 11014, collected by A. A. Olsson at Bayovar, Piura; Nos. 34284 and 34300, presented by Sr. Constante Larco Hoyle in 1939; and M.C.Z. No. 17383, collected by G. K. Noble at Chongollapi, Piura, in 1916. These are in close agreement with the type. The last-named specimen has the loreal fused with the prefrontal on both sides. With these may be associated the U. S. National Museum specimen from Piura collected by C. H. T. Townsend; two British Museum specimens recorded from the Catamayo Valley in Ecuador by Parker; and two specimens reported by Peracca from Puntilla Santa Elena, in "a dry region of the coast" of Ecuador, west of Guayaquil; with the type, there are five female and seven male specimens. Ventrals and caudals in this series may be compared with those of the typical race:

Subspecies	Number of specimens	Sex	Ventrals	Caudals
f. fitzingeri	4	♀	227–236	77–94
f. frizzelli	7	♂	188–206	68–77
	5	♀	202–207	57–69

Amaral (1925, p. 12) noted the wide difference in ventrals between the male specimen from Piura and the female from Verrugas Canyon, supposing this to be a sexual difference. The female specimens now at hand from northern Peru and adjacent Ecuador make it clear that a distinct geographic race (with intermediates not yet demonstrated) is recognizable in this region.

Range.—Coastal Peru from Pacasmayo to Piura, in the adjacent Catamayo Valley in Ecuador, and in the dry coastal area near Guayaquil.

Remarks.—The Peruvian and Guayaquil series of five male and five female specimens forms a compact group with ventrals 197–206 in males and 202–207 in females. Two specimens, both males, reported by Parker from the Catamayo Valley, indicate a possible further reduction of ventrals in populations to the northeast, as these specimens have ventrals respectively 188 and 190.

Tachymenis peruviana Wiegmann

Tachymenis peruviana Wiegmann, Nova Acta Acad. Leop.-Carol., **17**, p. 252, pl. 20, fig. 1, 1835—Peru.

Tachymenis peruviana is the common highland snake in Peru, ranging above 15,000 feet on the plateaus and mountain masses and extending downward on both sides of the Andes to about 6,000 feet. In Chile it reaches sea level at the latitude of Coquimbo.

The wide range of this species and the large series accumulating in American museums warrant treatment of this species as a special problem.

Philodryas elegans rufidorsatus Günther

Dromicus rufidorsatus Gunther, Cat. Colubrine Snakes Brit. Mus., p. 130, 1858—America (here restricted to northern coastal Peru).

Tachymenis canilatus Cope, Proc. Acad. Nat. Sci. Phila., **20**, p. 104, 1868—Guayaquil.

Lygophis poecilostomus Cope, Journ. Acad. Nat. Sci. Phila., (2), **8**, p. 180, 1876—Valley of Jequetepeque.

Dryophylax vitellinus Cope, Proc. Amer. Phil. Soc., **17**, p. 33, 1877—Pacasmayo.

Dryophylax elegans Cope, Proc. Amer. Phil. Soc., **17**, p. 34, 1877.

Tachymenis elegans Boettger, Ber. Senck. Ges., **1889**, p. 312, 1889.

Philodryas elegans Boulenger, Cat. Snakes Brit. Mus., **3**, p. 1896 (part);[1] Werner, Abh. Mus. Dresden, **9**, No. 2, p. 9, 1901 (part).

[1] Boulenger includes *Dromicus rufidorsatus* in his synonymy of *elegans* with the notation "part," but we find no other reference to Gunther's species in his catalogue.

Philodryas simonsii Boulenger, Ann. Mag Nat. Hist., (7), 6, p. 185, 1900—Cajamarca at 9,000 feet

Philodryas elegans rufidorsatus is a small or medium-sized terrestrial snake with a dark vertebral band broken anteriorly into paired or alternating spots, or into crossbands. This band is separated from the light band bordering it on each side by a row of black dots, which fuse to form a continuous line posteriorly; below this is a darker lateral band.

This race ranges from the semi-arid areas near Guayaquil, Ecuador, to the Department of Libertad in Peru, from sea level to about 9,000 feet altitude.

We have examined twenty specimens: No. 5730, Verdun; No. 8386, Quebrada Sal Grande; Nos. 8387–8388, Quebrada Montero; 9807–9808, Quebrada Seca; Nos. 9776 and 9790, Quebrada Parinas; and No. 9791, Bayovar—all collected by A. A. Olsson; Nos. 8448–8449 from Parinas Valley, collected by E. W. MacCormack; No. 38682, Negritos, collected by H. E. Frizzell; all in the Department of Piura. Eight specimens were presented to the senior author at the Hacienda Chiclin, Libertad, in 1939.

This considerable series makes possible the partition of *elegans* with its complicated synonymy into a northern and a southern race, essentially paralleling other forms with two subspecies in the coastal province. The northern form may be redescribed as follows:

Description.—A slender, long-headed snake. Rostral much broader than deep in the adult, nearly as deep as broad in the young; frontal long and narrow; nasal divided; loreal about as long as deep; a single preocular which may reach the frontal or be separated from it to varying degrees; 2 postoculars; temporals 1–1, 1–2, or 1–3, usually with a small shield cut off from the anterior temporal so that the temporal formula may appear as 1–1–1, 1–1–2, 1–1–3, or 2–3; upper labials usually fourth and fifth entering the eye, occasionally 9; lower labials usually 10, six in contact with the chin shields, occasionally 9. Dorsal scale rows 19–17, 19 at mid-body. Ventrals 188–203, caudals 96–108 in males; 191–212 and 88–96 in females.

Coloration variable, typically with a darker dorsal band bounded by a lighter one, and with darker sides; head gray above with yellowish markings on the parietals and frontal; a darker grayish streak extending from the snout, through the eye, across the temporals and last upper labial to become continuous with the darker lateral band; upper and lower labials yellow with gray spots; venter yellow,

usually regularly spotted with brown or gray, occasionally uniform. One specimen completely uniform in coloration, like the type of *vitellinus;* two others approach uniformity of coloration.

Remarks.—The original description is poor and without exact locality. The fact that this form has been re-described four times as a new species seems to be related to the variable coloration and to the differences between the juvenile and adult, as well as to the fallibility of taxonomists.

Philodryas elegans rufidorsatus has heretofore been confused with *elegans elegans* of central and southern Peru. *P. e. rufidorsatus* has a somewhat lower number of ventrals and caudals, 17 instead of 15 scale rows posteriorly, and a somewhat different color pattern, when a pattern is developed.

Within *rufidorsatus* we can detect a cline in numbers of ventrals and caudals from north to south, as in *Oxyrhopus fitzingeri.*

Region	Number of specimens	Sex	Ventrals	Caudals
	Philodryas elegans rufidorsatus			
Piura	5	♂	188–203	99–108
	4	♀	191–212	88–96
Libertad	4	♂	195–199	96–108
	5	♀	199–207	89–94
	Philodryas elegans elegans			
Central and southern Peru	6	♂	207–217	112–123
	3	♀	199–203	97–111

Philodryas elegans elegans Tschudi

Lygophis elegans Tschudi, Fauna Peruana, Herp., p. 53, pl. 6, 1845—Urubamba and Lima (type locality here restricted to Lima).

Dromicus elegans Jan, Elenco Sist. Ophid., p. 67, 1863; Icon. Gén. Ophid., Livr. 25, pl. 1, fig. 2, 1867.

Philodryas elegans Boulenger, Cat. Snakes Brit. Mus., 3, p. 133, 1896 (part); Werner, Abh. Mus. Dresden, 9, No. 2, p. 9, 1901 (part); Amaral, Proc. U. S. Nat. Mus., 67, Art. 24, p. 15, 1925.

Dryophylax freminvillei Duméril and Bibron, Erp. Gén., 7, p. 1115, 1854—Guyane and Callao, Peru (type locality here restricted to Callao).

Philodryas freminvillei Jan, Elenco Sist. Ophid., p. 83, 1863; Icon. Gén. Ophid., Livr. 49, p. 4, fig. 2, 1879.

Philodryas elegans elegans is a ground snake with a conspicuous dark dorsal band which is continuous anteriorly instead of being broken into spots and which is bounded by a continuous black line instead of the row of black spots of *elegans rufidorsatus.* It has,

apparently, a considerably higher number of ventrals and caudals in both sexes.

This subspecies extends southward in the arid coastal region from the Rimac Valley to northern Chile. It is known to us from two specimens in Field Museum, Nos. 34177–34178, collected at the Cajamarquilla ruins, near Lima, by the senior author, and from a specimen in the Museum of Comparative Zoology, labeled only "Peru." Boulenger's specimens from Lima and the Island of San Lorenzo agree excellently with our Cajamarquilla specimens and with the type in numbers of ventrals and caudals. We are unable to allocate all of the specimens reported by Boulenger and all of the cotypes of *Dryophylax freminvillei*, without re-examination of the specimens, since many of them have inadequate data as to locality or sex. There is some indication that a third form with fewer ventrals and caudals is to be found in southern Peru and adjacent Chile (cf. Boulenger's specimens from Tacna and Chile).

Amaral's record of this species from Valparaiso, Chile, is doubtless in error.

Oxybelis acuminatus Wied

Coluber acuminatus Wied, Isis, p. 667, 1824; Beitr. Naturg. Bras., 1, p. 322, 1825—Espirito Santo River, Brazil.

Dryiophis acuminata Cope, Proc. Amer. Phil. Soc., 17, p. 34, 1877; Boettger, Ber. Senck. Ges., 1889, p. 314, 1889.

Oxybelis acuminatus Steindachner, Reise Novara, Rept., p. 177, 1867; Dunn, Proc. Biol. Soc. Wash., 36, p. 186, 1923; Parker, Ann. Mag. Nat. Hist., (11), 2, p. 445, 1938.

This extremely elongate snake, often referred to as a typically arboreal form, appears to extend into arid regions in many parts of its range. It is one of the few forms in coastal Peru not racially distinguishable, as far as is known, from specimens in other parts of its vast range, which extends from northern Mexico to eastern Brazil and Bolivia.

There are no specimens of this species from coastal Peru in the collections at our disposal.

Tantilla melanocephala capistrata Cope

Tantilla capistrata Cope, Journ. Acad. Nat. Sci. Phila., (2), 8, p. 181, 1876—Valley of Jequetepeque, Libertad, Peru.

Tantilla melanocephala (not of Linnaeus) Dunn, Proc. Biol. Soc. Wash., 36, p. 186, 1923; Parker, Ann. Mag. Nat. Hist., (11), 2, p. 445, 1938.

Tantilla melanocephala capistrata is a small terrestrial snake, brownish above with a black head and nape crossed by yellow bands on the snout and back of the head and with a yellow spot behind the eye. It is distinguished by contact of the prefrontal and second supralabial from the Amazonian race or races of *melanocephala.*

The range of *capistrata* as here defined appears to include besides northern coastal Peru the arid valley of the Marañon (Dunn, 1923) and the Catamayo and Malacatos valleys in southern Ecuador, thus transgressing the Andes.

Five specimens examined: four from Chiclin, Libertad, presented by Sr. Constante Larco Hoyle, F.M.N.H. Nos. 33744 and 34285–34287; and one collected by G. K. Noble at Perico, Cajamarca, in 1916, M.C.Z. No. 17391.

The Chiclin series includes three males with ventrals respectively 132, 133, and 133, and caudals 56, 30+, and 53; the single female has ventrals 143 and caudals 46. The Perico specimen, a female, has ventrals 155 and the tail incomplete. Parker's female specimen from the Catamayo Valley has ventrals 158, caudals 49. Thus the more northern specimens have a considerably higher number of ventrals; we assume that this gap may be filled by specimens from Piura. The Chiclin specimens agree in coloration with the type, which has ventrals 139 and caudals 71, and differs from our specimens in having only a single postocular.

Elapidae

Micrurus mertensi Schmidt

Elaps circinalis Cope, Proc. Amer. Phil. Soc., 17, p. 33, 1877 (not of Duméril and Bibron).

Micrurus mertensi Schmidt, Field Mus. Nat. Hist., Zool. Ser., **20**, p. 192—Pacasmayo; Parker, Ann. Mag. Nat. Hist., (2), **11**, p. 446, 1938.

A coral snake with black rings bordered by yellow rings, the black rings not in triads; top of head black, the black crown connected by a single black scale with the nuchal black ring; about 215 ventrals in males, 233 in females; and caudals respectively about 49 and 35.

Micrurus mertensi appears to be confined to the northern part of the Peruvian coastal region and the adjacent Catamayo Valley in Ecuador.

The type and paratypes were examined by the senior author in the Senckenberg Museum in 1932. His speculation as to a possible coastal locality, Chanchamayo, to account for a paratype so labeled

in the British Museum appears to be unnecessary in view of the common mislabeling of specimens from dealers; the "Chanchamayo" collection in the Dresden Museum, which includes coastal species like *Micrurus tschudii* and *Oxyrhopus fitzingeri*, re-enforces the suspicion that specimens from Carlos Schunke have repeatedly been mislabeled, perhaps through the fault of the receiving museum rather than his.

The relation of the coastal fauna to that of the Marañon Valley in Cajamarca may indicate that *Micrurus peruvianus*, from Perico and Bellavista, is more closely allied to *mertensi* than was thought when these two forms were described. Parker (1938, p. 446) has shown that this species meets *Micrurus ecuadorianus* and that it may be directly related; *Micrurus peruvianus* should also fall into this series of forms. Additional material is required for an adequate review of the problem thus raised.

A specimen in the collections of the Academy of Natural Sciences of Philadelphia, No. 6788, is presumably the specimen recorded by Cope from Pacasmayo; it is a male with ventrals 212 and caudals 42, and has black rings 18 + 6, thus differing slightly from the range of variation in the Senckenberg Museum specimens.

Micrurus tschudii tschudii Jan

Elaps tschudii Jan, Rev. Mag. Zool., 1858, p. 524, 1858—Peru (restricted to Rimac Valley, Department of Lima); Cope, Proc. Amer. Phil. Soc., 17, p. 33, 1877; Boettger, Ber. Senck. Ges., 1889, p. 316, 1889; Boulenger, Cat. Snakes Brit. Mus., 3, p. 422, 1896; Werner, Abh. Mus. Dresden, 9, No. 2, p. 10, 1901.

Micrurus tschudii Schmidt and Schmidt, Field Mus. Nat. Hist., Zool. Ser., 12, p. 132, pl. 12, 1925.

Micrurus tschudii tschudii Schmidt, Field Mus. Nat. Hist., Zool. Ser., 20, p. 202, 1936.

A coral snake readily distinguished from any other snake in the Peruvian coastal region by the arrangement of its black rings in triads, enclosing the pairs of yellow rings within the outer black rings and the triads separated by relatively narrow red rings. Distinguished from the subspecies *olssoni* by black spotting of the lower labials and anterior chin shields and of the yellow rings, by the tendency for the first black ring (the nuchal ring) to be complete beneath, and by a lower number of ventrals.

The typical subspecies ranges from the Department of Libertad to the Rimac Valley. See discussion of the variation cline under *Micrurus tschudii olssoni*, below.

Micrurus tschudii olssoni Schmidt and Schmidt

Micrurus olssoni Schmidt and Schmidt, Field Mus. Nat. Hist., Zool. Ser., 12, p. 130, pl. 11, 1925—Negritos, Piura, Peru.

Micrurus tschudii olssoni Schmidt, Field Mus. Nat. Hist., Zool. Ser., 20, p. 202, 1936.

Micrurus tschudii Amaral, Proc. U. S. Nat. Mus., 67, Art. 24, p. 17, 1925; Parker, Ann. Mag. Nat. Hist., (11), 2, p. 445, 1938.

Distinguished from *Micrurus tschudii tschudii,* in addition to the characters mentioned above, by considerably larger size.

Confined to the northern part of the Peruvian coastal region, in Piura, perhaps meeting *M. t. tschudii* in Libertad, and ranging from Piura into southern Ecuador, where, as Parker (1938, p. 445) points out, an additional form may perhaps be distinguished.

Considerable series of *Micrurus tschudii* are now available, and examination of these specimens shows that there is a well-marked cline in the number of ventrals from low at the north, in the Catamayo Valley in Ecuador, to high in the Rimac Valley. This is shown below.

Region	Number of specimens	Sex	Ventrals	Number of triads
Catamayo Valley	1	♂	190	
	2	♀	195–196	13–14
Piura	7	♂	196–204	10–12
	5	♀	206–213	10–13
Libertad and Ancash	8	♂	202–215	13–17
	10	♀	209–226	12–19
Lima	6	♂	206–216	14–19
	5	♀	216–232	13–16
"Bolivia"	1	♂	200	20
	3	♀	204–207	17–22

The regularity of the above tabulation is marred by a male specimen in the Museum of Comparative Zoology from the desert between Trujillo and Chicama (No. 43751) with ventrals only 188, and a similarly aberrant male from Chiclin with only 193. It is by no means impossible that the Chiclin specimen might have been collected at a more northern locality, as the collection received from the Hacienda Chiclin had accumulated over a considerable period of years.

A further difficulty arises in allocating specimens without specific locality or with the supposedly erroneous locality Chanchamayo; we have assigned these as best we could to the Department of Lima.

Four specimens in the Museum d'Histoire Naturelle in Paris, collected by M. Wiener, are entered as from "Bolivia." We believe this to be in error. These specimens have a low number of ventrals, agreeing with the Piura series, but have a higher number of triads than is to be found in the forty-five other specimens.

On the whole, the most conspicuous step in the cline of ventrals is between the Chiclin and Pacasmayo specimens and the series from Piura. Thus the break between the northern and southern forms does not correspond with that in *Oxyrhopus fitzingeri* or *Philodryas elegans*. It may well be that the supposed "step" is illusory and that a larger and more widely distributed series will exhibit a more uniform cline.

Crotalidae

Trimeresurus barnetti Parker

Bothrops barnetti Parker, Ann. Mag. Nat. Hist., (11), 2, p. 447, 1938—mouths of the Quebradas Honda and Perines between Lobitos and Talara, Piura, Peru; paratypes from Lobitos.

T. barnetti is a small desert pit-viper closely resembling the fer-der-lance (*T. atrox*) but differing in its smaller size, lower number of subcaudals, and the enlarged terminal scute of the tail.

This species is known only from the low coastal desert of northern Piura, between Lobitos and Negritos.

The material examined consists of a single female specimen, F.M.N.H. No. 11013, collected at Quebrada Parinas near Negritos by A. A. Olsson, May, 1928. This has ventrals 184, caudals 43, and agrees essentially with the type series; a row of small lateral spots present in our specimen is not mentioned by Parker.

Trimeresurus pictus Tschudi

Lachesis picta Tschudi, Fauna Peruana, Herp., p. 61, pl. 10, 1845—higher montaña of Peru (in error); Boulenger, Cat. Snakes Brit. Mus., 3, p. 540, 1896—Lima, Peru.

Bothrops pictus Jan, Elenco Sist. Ophid., p. 126; Icon. Gén. Ophid., Livr. 47, pl. 3, fig. 3, pl. 4, fig. 2, 1875; Amaral, Proc. U. S. Nat. Mus., 67, Art. 24, p. 29, 1925.

Trimeresurus pictus is a medium-sized pit-viper characterized by a lower number of scale rows at mid-body than *barnetti*, 21–23 as opposed to 23–25, a series of irregular mid-dorsal blotches, two rows of alternating lateral spots, and a head pattern of obliquely transverse markings.

This is the common pit-viper of the coastal desert region, ranging from Libertad south to Arequipa. It is said to occur at Chiclin, and is here reported from Chimbote, Chosica, and the Majes Valley.

We have examined six specimens, F.M.N.H. Nos. 5662–5664, from Chimbote, Ancash, collected by M. P. Anderson in 1912; No. 39991, from the Majes Valley, collected by Sr. Romano; M.C.Z. No. 3573, taken at Lima by Samuel Garman; and M.C.Z. No. 45716, from Chosica, collected by David and Bruce Hertig and G. P. Gardner in 1940.

In the three male specimens the ventrals number 167–169 and caudals 46–49; in three females 170–173 and 44–48. We assume the number of caudals given by Tschudi, 74, to be a misprint for 47. Our series agrees well with Boulenger's re-description of the species, but exhibits considerable variation in the head shields. Scale rows between eye and upper labials one or two; upper labials 8 to 12, the second usually entering the pit, occasionally the third (one side on M.C.Z. No. 45716), or none (F.M.N.H. No. 39991). The general coloration may be pale brown or light gray. With the few specimens available, we are not able to divide the series into a northern and a southern race, as we had thought might be possible (Schmidt and Walker, 1943, p. 295).

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THREE NEW SNAKES FROM THE PERUVIAN ANDES

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In the course of recent studies on the coastal snakes of Peru, three undescribed forms from the eastern Andean area have come to our attention. These new forms, of the colubrid genera *Dromicus* and *Atractus*, are described below.

Dromicus inca sp. nov.

Type from Cajamarca, Department of Cajamarca, Peru. No. 5713 Field Museum of Natural History. Young male. Collected by W. H. Osgood and M. P. Anderson in April, 1912.

Diagnosis.—A *Dromicus* closely allied to *angustilineatus* in color pattern but differing from that species in having a lower number of ventrals, 184 as opposed to 195 for the minimum in males of *angustilineatus;* differing also in having a more distinct lateral stripe.

Range.—Known only from the type locality.

Description of type.—A snake of typical colubrid proportions; posterior maxillary teeth enlarged but not grooved; hemipenis bifurcate, with bifurcate sulcus spermaticus and calyculate tip.

Rostral broader than deep, just visible from above; internasals shorter than the prefrontals; frontal twice as long as broad, longer than its distance from the end of the snout, as long as the parietals; supraoculars of moderate size; nasal divided; loreal nearly as deep as long; one preocular reaching the top of the head but not in contact with the frontal; two postoculars; temporals 2–3; eight upper labials with the fourth and fifth entering the eye; ten lower labials, five in

contact with the anterior chin shields, which are slightly shorter than the posterior pair.

Dorsal scales smooth with a formula of 19–19–15; apical pits present, single; ventrals 184; anal divided; subcaudals 110.

Coloration similar to that of *angustilineatus;* a black mid-dorsal line one scale wide throughout most of its length, widening a little on the neck; on either side of this a light brown band with a barely distinguishable row of dark spots down its center; below this a distinct dark brown stripe bounded above by a faint dark line; first and second rows of scales light brown, with a row of darker spots on the first; belly mottled gray and yellow; head brownish, with a dark brown stripe extending from the snout through the eye and across the temporals to become continuous with the dark lateral stripe; labials and chin, abnormally darkened through preservation, probably yellow with grayish markings in life.

Measurements of type.—Total length 278; tail 77.

Remarks.—This species greatly resembles *angustilineatus* (Schmidt and Walker, 1943, p. 308) from the southern part of the coastal region, and with more material available, especially from central Peru, it may prove to be a northern and eastern race of that species. The lower ventral count, and the large geographic hiatus between the two forms warrants the description of *inca* as a new species. Moreover, *angustilineatus* does not seem to be represented in the coastal fauna of central and northern Peru, to judge from its nonappearance in collections from the departments of Lima, Ancash, Libertad, and Piura.

Atractus pauciscutatus sp. nov.

Type from Carpapata, in the upper Chanchamayo Valley, northeast of Tarma, Department of Junin, Peru. Altitude 10,500 feet. No. 36725 Field Museum of Natural History. Adult female. Collected by Felix Woytkowski May 14, 1940, on a footpath through stony ground, at night.

Diagnosis.—An *Atractus* close to *bocourti* in coloration, but differing in having ventrals 146 as opposed to the much higher range of 170–182 in females of *bocourti* known to us.

Range.—Known only from the type locality in the Chanchamayo Valley.

Description of type.—A small ground snake with a moderately stout body, a small head barely distinguishable from the neck, and a short tail; maxillary teeth decreasing in size posteriorly.

The rostral broader than deep, just visible from above; internasals small, less than half the length of the prefrontals; prefrontals large; frontal small, as broad as long, as long as its distance from the internasals, much shorter than the parietals; supraorbitals moderate; nasal divided; loreal twice as long as deep; no preocular; 2 postoculars; temporals 1–2; supralabials 7 on the right side and 6 on the left, the third and fourth entering the orbit on both sides; 7 lower labials, the first four in contact with the single pair of chin shields.

Dorsal scales smooth, without pits, with formula 17–17–17; ventrals 146; anal entire; subcaudals 18.

Coloration very similar to that of *bocourti*, the body pale brown above with a narrow black vertebral line, and most of the lateral scales marked with black, many of these black spots running together in such a way as to give the impression of two irregular and discontinuous lateral lines on each side, these lines converging on the tail to form one distinct lateral line; head brown, mottled with black, and with a black stripe extending from the nostril back through the eye and across the posterior supralabials; a transverse stripe on the nape; belly and tail yellowish, mottled with black, with a row of partly confluent streaks forming two lines along the sides.

Measurements of type.—Total length 330; tail 27.

Atractus nigricaudus sp. nov.

Type from Huachon, east of Cerro de Pasco, Department of Junin, Peru. Altitude 10,000 feet. No. 45909 Museum of Comparative Zoology. Adult female. Collected by W. F. Walker, December 18, 1938.

Diagnosis.—An *Atractus* close to *bocourti* and *pauciscutatus*, differing in having ventrals 157–158 in females, thus significantly separated from *bocourti* with ventrals 170–182 in females, on the one hand, and from *pauciscutatus* with ventrals 146 in the same sex on the other; differing from both in having the under side of the tail entirely or nearly entirely black, and from *pauciscutatus* in having the frontal as long as its distance from the end of the snout, instead of as long as its distance from the internasals.

Range.—Known only from Huachon in the upper part of the Paucartambo Valley.

Description of type.—A small ground snake with a moderately stout body, a small head barely distinguishable from the neck, and a short tail; maxillary teeth decreasing in size posteriorly.

The rostral broader than deep, barely visible from above; internasals very small, about one-third the length of the prefrontals; prefrontals large; frontal nearly as broad as long, as long as its distance from the end of the snout, shorter than the parietals; supraoculars of moderate size; nasal divided; loreal 2½ times as long as deep; no preocular; 2 postoculars; temporals 1–2; upper labials 7, the third and fourth entering the eye; lower labials 7, the first four in contact with the single pair of chin shields.

Dorsal scales smooth, without pits, with the formula 17–17–17; ventrals 157; anal entire; subcaudals 19.

Coloration obscure, as the skin was evidently about to be shed; resembling that of *pauciscutatus*, the body pale brown above with the scales marked with black; a black vertebral line and faint indications of two lateral lines on each side converging to form one on the tail; head brown, mottled with black, with a longitudinal black stripe passing through the eye, and a transverse one on the nape; belly yellowish, mottled with black, and on each side a row of partly confluent streaks forming two lines along the sides; the under side of the tail nearly entirely black.

Measurements of type.—Total length 367; tail 32.

Notes on paratype.—A single specimen, M.C.Z. 45910, a young female, was collected with the type. It agrees very well with the type, except in having a somewhat shorter loreal (possibly a juvenile character); ventrals 158; subcaudals 17. The color pattern is less obscure. The under side of the tail is entirely black. Total length 145; tail 10.

Remarks.—These two new species of *Atractus* are obviously closely related to one another, but the genus is in such a confused state that their affinities with other forms can only be guessed. Among the Peruvian members, they appear to be closest to *bocourti* (Boulenger, 1894, p. 306). These three species seem to form a compact group, with *bocourti* probably limited to the Huallaga Valley where it is known to occur from 300 feet to about 7,000. It has been taken at Acomayo (the type locality),[1] Yurimaguas (Boulenger, 1896, p. 645), and Taruco (a series collected by the junior author) near Acomayo. The ventrals of this form, in females, range from 170 to 182. *A. nigricaudus* and *A. pauciscutatus* are found slightly

[1] According to Stiglich (1922) there are two localities of this name, one near Niepos in the Pacific drainage of the Department of Cajamarca, and one in the upper Huallaga Valley in the Department of Huanuco. The latter is the more likely in view of other specimens taken in the Huallaga Valley.

to the south at about 10,000 feet, in two separate tributaries of the Perené, thus isolated from the Huallaga Valley by a mountain range some 12,000–13,000 feet high, and somewhat less sharply from each other. Thus the *bocourti* stock appears to have spread up the Perené and its tributaries from lower elevations, becoming quite distinct from the parent *bocourti* beyond the Huallaga divide, and breaking up in turn into two somewhat less sharply distinguished forms in the two valleys tributary to the Perené. To our knowledge, no other species of *Atractus* occurs in the above-mentioned valleys. It seems evident that the secretive habits of the species of *Atractus* are associated with the great number of geographic forms already known in this genus.

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AMPHIBIANS AND REPTILES FROM THE SUDAN

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A small series of reptiles and amphibians recently acquired by Field Museum of Natural History from Dr. Neal A. Weber, of the University of North Dakota, was collected by him in the Imatong Mountains near the Uganda border of the Anglo-Egyptian Sudan, in 1939, as a by-product of his entomological collecting. These specimens, though representing only seven species, afford a first glimpse of the herpetological fauna of this well-isolated range, whose upper slopes are covered by mountain rain-forest, while the high peak of Mount Kineti (10,458 feet) is a grassy "bald." The zoogeographic interest of the isolated mountain forests of East Africa is great, involving, as it does, consideration of geologic and climatic history and differential rates of speciation in plants and various groups of animals. Important contributions to the study of the reptilian and amphibian faunas of these forests isolated by open country have been made by Mr. Arthur Loveridge, who has outlined the problems in the summary report (1933) of his expedition to Tanganyika in 1929.

The collection includes specimens of the extremely wide-ranging toad *Bufo regularis* and of the equally widespread frog *Rana mascareniensis*. Two specimens represent the common spiny-footed skink *Mabuya varia*. These are essentially species of the African savanna, as is the single blind snake, *Typhlops punctatus*, and they offer no clue to any mountain endemism in the Imatong range. Much more interesting and significant is a single specimen of a small skink from the montane rain-forest, evidently a representative of the African group currently referred to *Siaphos*, but not identifiable with any of the African forms now known. There is also a new dwarf race of chamaeleon, of the *Chameleo bitaeniatus* series. This species is extensively represented by endemic races on the isolated mountain groups of East Africa.

LIST OF SPECIES

Bufo regularis regularis Reuss

Bufo regularis Reuss, Mus. Senck., 1, p. 60, 1834—Egypt.

Bufo regularis regularis Loveridge, Occ. Papers Bost. Soc. Nat. Hist., 8, p. 53, 1932.

A single specimen from Longoforok, east side of Imatong Mountains, altitude 1,367 feet. Collected beside cot in rest house; July 30, 1939.

Rana mascareniensis mascareniensis Duméril and Bibron

Rana mascareniensis Duméril and Bibron, Erp. Gén., 8, p. 350, 1841—Madagascar, Mauritius, and Seychelles.

Rana mascareniensis mascareniensis Loveridge, Bull. Mus. Comp. Zool., 72, p. 385, 1930.

A single specimen from the Lotti Forest, west side of Imatong Mountains, altitude 3,300 feet. Collected August 5, 1939.

Mabuya varia Peters

Euprepes (Euprepis) varius Peters, Monatsber. Akad. Wiss. Berlin, 1867, p. 20, 1867—Tette, Mozambique.

Mabuya varia Loveridge, Bull. U. S. Nat. Mus., 151, p. 74, 1929.

Two specimens from the top of Mount Kineti, 10,458 feet, collected July 27, 1939. I find no differences between these specimens and others from East Africa.

Leptosiaphos subgen. nov.

Type.—Lygosoma meleagris Boulenger.

Diagnosis.—A group of small elongate skinks constituting a biological series with degenerative steps of evolution represented by various reductions in the size of the ear opening, the relative size of the limbs, and the number of digits; differing from the Australian *Siaphos equale* (the type of *Siaphos* Gray) in slenderness of body and tail, which are less muscular and less cylindrical, and in slenderness of digits, in which the subdigital lamellae are small and more numerous than the scales on the upper surface of the digit.

As here understood, *Leptosiaphos* includes the thirteen forms listed in the following table. Boulenger (1909, p. 243) first called attention to the fact that the species then known formed a compact, related series.

SPECIES OF *Lygosoma* (*Leptosiaphos*)

	Type locality
aloysii-sabaudiae Peracca......	Mitiana and Toro, Uganda
blochmanni Tornier............	Lake Kivu, Belgian Ruanda-Urundi
burgeoni Witte................	Kalonge (6,800 feet), Mount Ruwenzori, Belgian Congo
compressicauda Witte..........	Sandoa, Katanga, Belgian Congo
graueri Sternfeld..............	Mount Karisimbi, Belgian Ruanda-Urundi
helleri Loveridge..............	Bugongo Ridge (9,500 feet), Mount Ruwenzori, Belgian Congo
kilimensis Stejneger...........	Mount Kilimandjaro, Tanganyika Territory
kutuensis Lönnberg...........	Kutu (between Fort Hall and Embu Boma), Kenya Colony
luberoensis Witte..............	Lubero (west of Mount Ruwenzori), Belgian Congo
meleagris Boulenger...........	Mubuku Valley (7,000 feet), Mount Ruwenzori, Uganda
quattuordigitata Sternfeld......	Rugege Forest, Belgian Ruanda-Urundi
thomasi Tornier...............	Nairobi, Kenya Colony
weberi sp. nov.................	Mount Kineti (3,300 feet), Imatong Mountains, Anglo-Egyptian Sudan

Siaphos,[1] to which these lizards have been referred in recent literature, may be applicable to a parallel series of forms in the Australian region that likewise exhibit a trend toward reduction of the limbs and finally of the digits. The type of *Siaphos* is the Australian *S. equale*.

Sternfeld, in describing *graueri*, divides his specimens into a five-fingered and a four-fingered series, naming them, with a fine disregard for the principles of nomenclature, *quinquedigitata* and *quattuordigitata*. These appear to be valid geographic forms; *quinquedigitata*, regarded as the typical subspecies, becomes *graueri graueri* (Loveridge, 1936, p. 72). Loveridge refers his new form *helleri* to subspecific status under *meleagris*. I have left all of the named forms as species, since a comprehensive study is required to clear up the taxonomy of the group. Sternfeld's reference of a four-fingered and a five-fingered form to the same species calls attention to an important matter in such degenerating series, namely, the increased variability and hence reduced significance of a character of such apparent importance as the presence or absence of a vestigial finger.

While some of the forms of *Leptosiaphos*, such as *meleagris* and *graueri*, are well known and are represented by considerable series in museum collections, a number are inadequately characterized,

[1] Originally spelled *Saiphos*, emended by the author (Gray, 1831, p. 72; 1845, p. 88).

and thus represent taxonomic hypotheses, subject to verification or disproval as further data become available. This is not especially a reproach, since it differs in no way from the widely approved method of research by means of a working hypothesis. The new form described below, while apparently well distinguished, is based on a single specimen and obviously requires additional specimens to establish its range of variation and its relations. Revision of the group will necessarily be long postponed.

The "building block" method of establishing genera by the brigading of demonstrably related species, instead of by the arbitrary partition of larger groups of species into smaller on the basis of characters thought to be of "generic" value, appears to represent a modern trend of great importance to systematic zoology. It is excellently illustrated by the inclusion in the genera *Storeria, Pituophis,* and *Salvadora* of Mexican species that lack the characters diagnostic of the majority of the species of these genera. This method merely involves an emphasis on inductive method as opposed to deductive.

Malcolm Smith has recently opened, or rather renewed, the discussion of the partition of the great series of species of skinks lumped under the generic heading "*Lygosoma*" in Boulenger's Catalogue of Lizards. It has long been taxonomic practice, followed essentially for reasons of convenience, to recognize the Boulengerian sections of *Lygosoma* as genera, following the example of Stejneger (in various papers, cf. 1899, 1907). The fact that generic names serve a double purpose, that of taxonomic convenience on one hand and of an index to phylogenetic relations on the other, does not seem to me especially disturbing or even inconsistent. The arrangement in groups for easier taxonomic review represents a primitive stage in the classification of most groups of animals, and the improvements in that classification, based on continuing zoological research, have been consistently in the direction of a more natural system. The whole course of systematic zoology, following the establishment of the Linnaean classification, in which, for example, salamanders and crocodiles were included in the genus *Lacerta,* illustrates this evolution of zoological classification.

The employment of the sections of *Lygosoma* (in the broad sense of older authors) as genera without continuing critical analysis and review, represents a primitive stage in our knowledge of the lizards so grouped. Malcolm Smith's review represents a competent *zoological* study, marking a real advance from the stage in which an

artificial systematic arrangement represents "taxonomic convenience," and directed toward a more natural classification that approximates the phylogeny of the group. Since much more study is required for the permanent clarification of this group, there is no grave reason against continuing the use of the sections of *Lygosoma* (as restricted by Smith) as generic, subgeneric, or sectional names, or even to multiplying them.

Lygosoma (Leptosiaphos) weberi[1] sp. nov.

Type from Lotti Forest, west side of Imatong Mountains, Anglo-Egyptian Sudan. Altitude about 3,300 feet, in heavy rain-

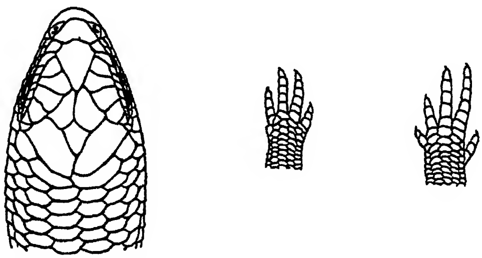

FIG. 27. Head and feet of *Lygosoma (Leptosiaphos) weberi*, type. × 4.

forest. No. 34483 Field Museum of Natural History. A juvenile male. Collected August 5, 1939, by Neal A. Weber.

Diagnosis.—A species of the group of elongate dwarf skinks referred in this paper to the new section *Leptosiaphos*, with minute ear opening, with four fingers and five toes, and frontonasal entire. Distinguished from *S. graueri*, to which it is thus allied, by the less elongate body and by having fingers and toes longer, the digital scales 4–5–5–3 on the fingers and 3–6–5–3–2 on the toes.

Description of type.—Body and tail elongate, subcylindrical; adpressed limbs failing to meet by the length of the forearm; head little wider than body, limbs much reduced, fingers and toes short, 4–5. Scales around body 22, all smooth; dorsals in a longitudinal row 58; median subcaudal scales a little widened. Rostral followed by an undivided frontonasal, broadly in contact with the frontal; prefrontals very small, lateral; supraoculars 4; superciliaries 7; labials 6 above and 7 below; frontoparietals a little larger than the

[1] Named for the entomologist Neal A. Weber, Assistant Professor of Zoology at the University of North Dakota, to whose enterprise the small herpetological collection here reported is due.

occipital; a pair of elongate nuchals behind the parietals; temporals 2–2, the upper anterior the largest; one pair of chin shields in contact behind the postmental.

Scales on the upper sides of the digits large and much longer than the subdigital lamellae; these scales, counting from the inner fingers and toes outward, are respectively 4–5–5–3 on the fingers and 3–6–5–3–2 on the toes. The subdigital lamellae are 5–10–10–5 and 6–14–12–8–3.

General color brown above, paler beneath; obscurely lineate above and on the sides because of darker spots on the centers of the scales; the ventral scales unspotted, the ventral caudals pigmented; the upper labials each with a large brown spot, the lower labials with small spots.

Measurements.—Head and body 33; tail 42 (incomplete); arm 6.5; leg 8.

Chameleo bitaeniatus kinetensis subsp. nov.

Type from Mount Kineti, Imatong Mountains, Anglo-Egyptian Sudan. Altitude 10,458 feet. No. 34484 Field Museum of Natural History. Adult female. Collected July 27, 1939, by Neal A. Weber.

Diagnosis.—Directly allied to *Chameleo bitaeniatus ellioti,* from which it is distinguished primarily by its smaller size and less uniform dorsal crest.

Description of type.—Body form like that of *Chameleo b. ellioti* but less elongate, the tail longer than the body. Head with low casque and forked occipital ridge. Scaling of body uniform except for an obscure dorso-lateral row of enlarged rounded tubercles; dorsal crest obscurely saw-like, the tubercles in groups of four or five increasing from a very small one to the largest, which is little more than 0.5 mm. in length; these groups more obscure on the tail; gular and ventral crests low.

Measurements.—Total length 115; tail 60; arm 27; leg 27.

Remarks.—The eggs number three in the left oviduct and five in the right and measure about 7 mm. in diameter. They are thus fewer in number and larger than in *ellioti.*

Chameleo bitaeniatus, on account of its wide distribution in East Africa, its wide range in altitude, and its partition into geographic forms, some of which are extremely well differentiated, is of more than ordinary interest, as may be seen from the accounts of the

species by Sternfeld (1912, 1912a) and Parker (1932). *C. bitaeniatus kinetensis* represents an independently evolved dwarf race. It is evidently derived from the lowland *C. b. ellioti* in the less favorable environment of the upper levels of Mount Kineti as *rudis* is from *graueri* on Mount Ruwenzori, and as *altaeelgonis* on Mount Elgon (Loveridge, 1935, p. 15) is from *hoehneli*.

It remains to be determined to what extent these dwarfed montane races are genetically fixed, and to what extent they exhibit variation gradients correlated with altitude.

Typhlops punctatus Leach

Acontias punctatus Leach, in Bowditch, Miss. Ashantee, p. 493, 1819—Fantee.

Typhlops punctatus Boulenger, Cat. Snakes Brit. Mus., 1, p. 42, 1893.

A single specimen typical of the lineolate Sudanese *punctatus*, from Lomariti, Imatong Mountains, collected August 4, 1939.

Atractaspis conradsi Sternfeld

Atractaspis conradsi Sternfeld, Sitzber. Ges. Naturf. Freunde, Berlin, p. 94, 1908—Ukerewe Island, Tanganyika Territory.

A single specimen from Issore, Imatong Mountains, collected August 3, 1939. This specimen has scale rows 23–23–19; ventrals 232; anal divided; caudals 26 (paired); upper labials 5; lower labials 7; oculars 1–1; temporals 1–2; total length 530, tail 39.

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THE WHITE SANDS EARLESS LIZARD

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Holbrookia maculata flavilenta Cope is a name that, for the past twenty years or so, has generally been associated with the peculiar, bleached population of earless lizards that inhabit the unique White Sands of southern New Mexico. This association has been incorrect, as the following discussion will demonstrate.

The White Sands *Holbrookia* has not been long known. In fact, as far as I am aware, the first mention of it was made by Ruthven, in 1907, who applied Cope's name of *flavilenta* and described in some detail the specimens he collected on the dunes. It is true that the history of the name *flavilenta* goes back much farther, and that many from elsewhere in New Mexico had been collected before 1907, but in spite of these facts Ruthven's specimens seem to have been the first known from the famous area about the dunes. No others were reported in the literature until 1942, with Bugbee's brief notes on the fauna of the area. This extraordinary paucity of published accounts does not necessarily imply a rarity of specimens—they are common enough on the dunes—or a general lack of knowledge of the existence of specimens. I have no doubt that after 1907 many more specimens found their way into various collections than published accounts would indicate. In fact, in 1931 I collected a series, the present location of which I unfortunately do not know, and a few collections I have examined contain others.

The responses of organisms to the extraordinary environment afforded by the White Sands have received the attention of many naturalists. In spite of the unique nature of the environment, however, relatively few endemic forms are known from there. Only two of the twenty mammals known are considered distinct (*Perognathus apache gypsi* Dice and *Geomys arenarius brevirostris* Hall). Among the reptiles only one, the earless lizard, has been

considered distinct. The evolutionary problems are discussed by Benson (1933).

Three species of lizards, exclusive of *Holbrookia maculata*, occur commonly on the dunes: *Uta stansburiana stejnegeri*, *Sceloporus undulatus consobrinus*, and *Cnemidophorus perplexus*. Specimens of any of these species from the dunes are lighter than those from the surrounding plains, yet the differences are perhaps not so marked as in the case of *Holbrookia*. Circumstances indicate that perhaps the lighter colors of the other lizards are directly affected not so much by genetic as by environmental factors. The dunes form of *Holbrookia*, however, appears to owe its lighter color to genetic changes, rather than to direct environmental effect, as Atsatt (1939) suggests. That this is the case is indicated by failure of the pattern and color to change under laboratory conditions; Dr. L. C. Stuart has informed me that specimens kept more than a year and observed under various environmental conditions did not change appreciably. I examined his experimental animals after they had been preserved, and certainly they were not different in appearance from specimens preserved when collected.

The distinctive features of the White Sands specimens are (1) great reduction in size and prominence of the dorsal blotches, and (2) absence of the brown pigment. The gray pigment is present or absent; when absent the lizard is uniform cream yellow above, and even under the microscope no pigment granules can be discerned. In its greatest concentration, in the darkest specimen examined (Field Museum No. 28571), the gray pigment is rather extensively distributed over the dorsal surfaces, but is absent in small scattered particularly prominent areas on the sides of the body; the mid-dorsal area may be more or less uniform light gray; on either side of the mid-dorsum are some ten small, faint, poorly defined, more or less crescentic blotches.

Normal specimens of the presumed parent race (*m. approximans*) possess fairly well-defined dorsal blotches, and are provided with brown as well as black (gray) pigment. In almost all races of *maculata* the dorsal blotches may be absent or reduced in a small percentage of specimens; but in none is this the usual condition, and in none, so far as I am aware, is the brown pigment absent even as an anomaly. From these statements it might be assumed that the White Sands specimens could be positively identified in all cases. I am not certain this is true, for probably intergradation in

these characters occurs in the territory surrounding the dunes, where *m. approximans* occurs.

That the marked color change in the White Sands *Holbrookia* is an adaptation to the specific conditions of that small area is a reasonable assumption. All facts bear out that assumption. As a corollary it may be assumed that the same genetic form is not to be expected elsewhere. Yet the type locality of *flavilenta*, the name usually applied to the White Sands race, is Lake Valley, Sierra County, about 175 miles west of the dunes. Cope (1883, p. 10) describes the locality: "It is in the foot-hills of the Mimbres or Negretta range. The region is rather arid, springs not being numerous; but during July and August there are frequent rains. Vegetation is abundant in the form of grass and herbaceous plants and shrubs." This is not a habitat like that of the White Sands. It is much more reasonable to assume that *flavilenta* is based merely upon the spotless variant that occurs normally, but infrequently, in *approximans* at any part of its range. As described, the cotypes cannot be distinguished from *approximans;* I have not examined them and do not know whether they are now extant.

Most of the references to *flavilenta* that have been included under that name are actually referable to

Holbrookia maculata approximans Baird

Holbrookia propinqua Cope, Proc. Acad. Nat. Sci. Phila., **1866**, p. 303—Navajo Springs; Fort Wingate; San Francisco Mountains; Colorado Chiquito River; Zuni City.

Holbrookia maculata propinqua Coues, Wheeler's Surv. W. 100th Mer., **5**, p. 601, 1875—New Mexico, Arizona.

Holbrookia maculata flavilenta Cope, Proc. Acad. Nat. Sci. Phila., **1883**, pp. 10–11—orig. description; type locality Lake Valley, New Mexico; Stejneger, N. Amer. Fauna, **3**, pp. 109–110, 1890—western New Mexico; Arizona, except extreme southern portion; Moencopie and Little Colorado River, Painted Desert, Arizona; Cope, Ann. Rept. U. S. Nat. Mus., **1898**, p. 298, fig. 34, 1900—copy of original description; Stone, Proc. Acad. Nat. Sci. Phila., **1911**, p. 225—greasewood belt east of Alamogordo, New Mexico.

Authors who have seen or dealt specifically with specimens of *maculata* from the White Sands have considered them distinct from those of adjacent areas. Van Denburgh, I believe, had not seen specimens. This synonymy has been placed under the new subspecies here described.

Since Ruthven was the first to discover the White Sands race and to realize its distinctness, and has given more pertinent notes

on it than any other authority, it is appropriate that the race from that locality be known as

Holbrookia maculata ruthveni subsp. nov.

Holbrookia maculata flavilenta Ruthven, Bull. Amer. Mus. Nat. Hist., **23**, pp. 523–525, 1907—color, habitat, food; Schmidt, Bull. Amer. Mus. Nat. Hist., **46**, pp. 720–721, 1922—taxonomic notes; Atsatt, Publ. Biol. Sci. Univ. Calif. Los Angeles, **1**, p. 253, 1939—comment upon color; subspecific name misspelled *flavienta.*

Holbrookia maculata approximans Van Denburgh, Proc. Calif. Acad. Sci., (4), **13**, pp. 202–203, 1924—all New Mexico records for *maculata* subspecies referred to *approximans.*

Holbrookia maculata subsp. Bugbee, Trans. Kans. Acad. Sci., **45**, pp. 316, 317, 1942—brief notes on habits.

Type from White Sands, about twelve miles southwest of Alamogordo, New Mexico. No. 29452 Field Museum of Natural History. Female. Collected May 26, 1938, by Wilfred H. Osgood.

Paratypes.—Ten, including F.M.N.H. Nos. 28571, 29450–29451, same collector and date; U.M.M.Z. No. 64690, collected by S. C. Whitlock, July 10, 1927; A.M.N.H. Nos. 334–339, collected by Alexander Ruthven, A. F. Zimmer, and G. von Krockow, July 9 and 19, 1906; and A.M.N.H. No. 61764, collected by J. E. Hill, October, 1938.

Description of type.—Two rows of scales between occipital and the one or two rows of granules surrounding the supraocular area, except at one point, where two adjacent scales are fused; frontal scales irregular, a pair of median scales bordered anteriorly and posteriorly by an azygous scale; internasals in about three rows; four scales bordering rostral behind, between anterior supralabials; two large canthals; no subnasal; four loreal rows, one scale in upper row, two rows between anterior canthal and supralabials; enlarged supralabials in contact with subocular posteriorly; supralabials low, elongate, overlapping about half their length. Dorsal scales small, smooth, convex; lateral scales smaller, somewhat protruding; ventral scales smooth, flat; scales on dorsal surfaces of limbs smooth; only distal caudal scales keeled. Femoral pores 10–10.

Snout to vent, 49.5 mm.; tail 41 mm.

The dorsal color, which seems to be well preserved, is a light, grayish cream, more yellowish on the sides. Extremely faint light spots, covering some eight to ten granules, are barely visible in the dorsolateral region; the mid-dorsal area of body, tail, and dorsal surfaces of limbs are perfectly uniform. Under the microscope no

pigment granules are discernible except on the sides of the belly, where on each side two small, black spots are formed by a concentration of dark pigment granules; a point halfway between axilla and groin is between the two dark spots; the anterior spot is slightly posterior to the elbow.

Variation.—The darkest paratype examined (No. 28571) was described briefly above. The lateroventral spots are large and distinct. This is a relatively large male with a broken tail, measuring 53 mm. snout to vent. The other paratypes have varying amounts of pigment between these two extremes.

Ruthven describes the color in life of his specimens as follows:

"In one specimen the color of the dorsal surface is uniformly grayish white, except for faint traces of dusky on the hind limbs, sides of head, and base of tail, and numerous faint spots of orange yellow that at a distance give a slightly pinkish appearance to the body. The head is light golden yellow above. There is a faint pinkish line extending from the outer canthus along the sides of the body and base of the tail, and another from the angle of the mouth to the groin, which is continued along the inner and outer sides of the thigh and base of tail. Belly creamy white, immaculate.

"Two other specimens are almost identical in color with the last, except that the dusky markings on the back are slightly increased in amount, making the orange spots somewhat more distinct. In [one] the upper surface of the head is also marked with darker.

"Three others, while also very pallid, are a little darker than those described above. In the darkest individual the ground color is light gray, with numerous small dark spots interspersed with orange-colored ones; the dark spots distinct or obscure but without definite arrangement. The amount of dark pigment is greatest on the upper surface of the limbs and tail. The color of the head is light golden yellow, that of the under surfaces the same as in the other two specimens. The pinkish lateral line is not discernible."

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A STUDY OF THE TORRENT DUCKS

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This paper is based on a study of 144 specimens of torrent ducks, genus *Merganetta*, 45 from my own collection and 99 (all those available) borrowed from leading American museums. These specimens represent all the known forms. For their kindness in making these loans I am indebted to the American Museum of Natural History, Carnegie Museum, the Museum of Comparative Zoology, the United States National Museum, the Philadelphia Academy of Sciences, and the Museum of Vertebrate Zoology, University of California.

With full descriptions and colored plates of all the forms except *berlepschi* available in Phillips' "A Natural History of the Ducks," it has not been thought necessary to repeat such details in this paper. Instead I have limited myself to pointing out the distinctive characters between forms, and some features and variations not dealt with in that work.

The torrent ducks seem to fall into three divisions, a northern and a southern one, each containing a single race, and a central group of four races. While all the varieties are undoubtedly closely related, the northern and southern forms differ much more from the central group and each other, than the four central varieties do *inter se*. Since there also appears to be a rather extensive gap in distribution between the northern, the central and the southern divisions, it seems that the relationships are more clearly shown by separating the genus into three species than by including all six forms as races of one species. By doing this we have a northern and a southern monotypic species and a central one comprised of four races.

The resulting arrangement for the genus is shown in the following table:

Merganetta colombiana Des Murs
Merganetta leucogenis leucogenis Tschudi
turneri Sclater and Salvin
garleppi Berlepsch
berlepschi Hartert
Merganetta armata Gould

Merganetta colombiana Des Murs

Merganetta colombiana Des Murs, Rev. Zool., p. 179, 1845—no type locality given=Colombia by inference.

Range.—The northern Andes from the State of Merida, Venezuela, south through Colombia (all three ranges and Santa Marta) to central Ecuador (Chimborazo and Rio Pastaza). From central Ecuador to northern Peru (Molinopampa and Leimabamba, Amazonas) there seems to be a stretch of the Andes from which no merganettas have been recorded.

Males differ from those of the forms of *leucogenis* and *armata* by having the mantles brownish gray (not black, black streaked with white, or white) finely vermiculated with white. Nearest to typical *leucogenis* but smaller (wings 142–155 as against 165–176 mm.), and the dark shaft stripes to the feathers of the breast are narrower and lighter in color with the olive brown edges[1] to the scapulars and tertials, on the average, lighter, less reddish.

While the females of *armata* and of the forms of *leucogenis* are indistinguishable, those of *colombiana* can be easily separated. The under parts are much lighter, the color being more ochraceous (Ochraceous Tawny of Ridgway) than deep ferruginous. The posterior parts of the cheeks and sides of the neck are also of this ochraceous color whereas in the other species these parts are gray very finely barred with white. The upper parts have a somewhat lighter appearance, the dark centers to the scapulars and tertials being duller, less blackish, and therefore less in contrast to the lighter edges. This latter feature, however, is not very diagnostic. Wings 133–140 mm.

The immatures, like the females, differ from those of *leucogenis* and *armata*, although those of the two latter are alike. In *colombiana* the posterior parts of the cheeks and the sides of the neck are white

[1] In his description of the adult male Phillips writes: "The scapulars have . . . brown or pale gray edges." All the specimens examined have olive brown not pale gray edges.

(occasionally with slight specklings of dusky) while in the other species these parts are heavily sprinkled with gray.

In the first or immature plumage both sexes are alike. The upper parts, including the wings, are much as in the adult female but duller, and the lower back, rump and upper tail coverts are more broadly barred with dusky and white. On the under parts, however, where the female is orange red, the immature is pure white except for the sides and flanks which are broadly barred with dusky. The first tail feathers are dusky, broadly barred or irregularly streaked and spotted with white and when newly grown still have the downy rectrices attached at the end. The downy rectrices, however, break off shortly after the first immature feathers attain their full growth. These first feathers seem to be shed about the time the adult plumage begins to make its appearance and are replaced by a second set, which is dusky with a narrow band of white vermiculations along the edges of the webs. The third and final set of dusky adult feathers without white markings does not seem to be grown until some time after the fully mature plumage has been attained.

In none of the merganettas do young males pass through a female stage of plumage with the ferruginous-colored under parts, as has been suggested. Instead the series of immatures examined shows clearly that they pass from the white-breasted stage directly into the adult plumage.

In the young males of this species the first adult feathers to make their appearance are the dusky, olive-brown-edged ones of the lower mantle, scapulars and tertials about in the order named. Some of these are present even before the primaries are fully grown, but in these early ones the olive brown edges are much lighter than they become later. Next to appear are the black-striped feathers of the breast, together with the dusky and white vermiculated ones of the flanks, rump and upper tail coverts. At about this time the black feathers of the head and neck also come in.

Specimens of immature female torrent ducks are much rarer than those of males. From the four young females of this species examined (against twelve males) it appears that the females molt very quickly into the ochraceous-breasted plumage of the adult.

The downy young are colored as follows: Top of head, back of neck and rest of upper parts including wings, and flanks blackish brown. Sides of head, including superciliary stripe, sides of neck and under parts white. A stripe through the eye and a spot about the ear blackish brown. There are white bars across the wings and

a broad stripe of the same color down each side of the back from the base of the wing to the rump. In the middle of the upper back is a large white spot. The tail is dusky, broadly tipped with white.

The breeding season of *colombiana* appears to be very irregular. Downy young have been taken in October and eggs in November. I have examined fully feathered immatures with the primaries not yet grown, taken in the months of January, March, April and September. Because of this irregularity the sixteen immature specimens examined do not give a clear picture as to the age at which this duck becomes adult, but from my study of the immatures of *armata* it probably does not take over a year.

The size of the wing spurs in both males and females appears to increase with age, as do those on the legs of some Gallinae. The spurs in the females, also, are much smaller than in the males. These two facts are often useful in judging the sex of immatures, and in ascertaining what variations in plumages are due to age and what to race.

Specimens examined.—VENEZUELA: Merida, 1; La Chuchilla, 2; Nebados, 2; Rio Alba, 2; Laguna Pan de Azucar, 1.—COLOMBIA: "Bogotá," 6; La Plata, Huila, 5; El Roble, Quindio Andes, 1; Rio Toche, east Quindio Andes, Tolima, 1; Cali, 1; Cauca Valley, 1; Salento, Cauca, 2; Cumbal, Narino, 1; Paramo de Purace, Cauca, 1; Munchique, Cauca, 3; west of Harmonde, Cauca Valley, 1.—ECUADOR: Oyacachi River, 3; upper Rio Pita, 4; above Tumbaco, 1; Rio Tumbaco, 2; Mount Chimborazo, 1; Antisana, 1; Cerro Galeras, Rio Pauchsi Yacu, 1; Rio San Pedro, near Tumbaco, 1; Rio Quijos, 1; Rio Ambato, 1; Cumbaya, 1; Sumaco, 1; Papallacta, 1; Tungaragua, Rio Ambato, 1; Rio Shubol, Chimborazo, 1; Cerro Mojanda, Imbabura, 1; Rio Mira, 1; La Palmera, near Baños, Rio Pastaza, 1; San Francisco, Rio Pastaza, 1; Rio Guaillabamba, Pichincha, 1; Rio Chalpi, 1.

Merganetta leucogenis Tschudi

In the males all forms of *leucogenis* can be distinguished from *armata* by having the cheeks, throat and foreneck white and from *colombiana* by having the mantle black (sometimes washed with olive) or black streaked with white, not brownish gray finely vermiculated with white.

Females can always be distinguished from the same sex in *colombiana* by having the posterior half of the cheeks and the sides of the neck gray finely barred with white instead of the same color

as the foreneck. However, in this species there is great variation in the color of the under parts, although the lightest of thirteen specimens examined is considerably darker than any of *colombiana.* In *leucogenis* the under sides vary from a deep to a pale ferruginous (Kaiser Brown to Cinnamon-Rufous of Ridgway). At first I thought that this paler coloration was probably due to immaturity, but on closer examination I found that some of the lighter-colored specimens had well-developed wing spurs while in one of the darkest females not only were these spurs very small but there were still some of the white immature feathers remaining on the abdomen. Owing to this variation lighter-breasted specimens of *leucogenis* are readily separable from *armata,* all the females of which seem to be a deep ferruginous, but darker examples are not.

Immatures of this species differ from those of *colombiana* as pointed out under that species, but cannot be told from those of *armata,* except that the males can be distinguished as soon as the adult facial markings begin to appear.

Merganetta leucogenis leucogenis Tschudi

Anas leucogenis Tschudi, Arch. Naturg., 9, (1), p. 390, 1843—Mana Rimacunan, sources of the Aynamayo, Junín, Peru.[1]

Range.—Andes of northern (Molinopampa, Amazonas) and central (Maraynioc, Junín) Peru.[2]

The males of this race differ from those of *turneri* and *berlepschi* in the much lighter breast and abdomen, the ground color of these parts being whiter and the dark shaft streaks narrower and perhaps not so blackish, especially about the chest and upper breast. They differ from those of *garleppi* and also *berlepschi* by having the mantle black (sometimes washed with olive), not streaked with white, and by having the edges to the scapulars and tertials reddish buff, not buffy gray or white. However, as is pointed out under that race, an occasional specimen of *garleppi* has these edges light reddish buff, but the mantle is streaked with white. Wings 165–176 mm.

Females are indistinguishable from those of the other races, except that those of the more southern forms seem to average larger. Wings 152–157 mm.

Only one immature specimen was available for examination. It differs from those of *colombiana* only by having the posterior parts

[1] Cf. Tschudi, Fauna Peruana, 1845–46, p. 312.

[2] The records given by Phillips for this form from Cuzco (Urubamba Valley, Rio Keatin, etc.) belong under *turneri.*

of the cheeks and sides of the neck finely speckled with dusky. Although this specimen is so young that the primaries are just beginning to grow, the edges to the scapulars already have a faint olive brownish tinge indicating that it is a male.

No specimens of downy young were available.

This race undoubtedly intergrades with *turneri* probably just south of Junín.

Specimens examined.—PERU: Molinopampa, Amazonas, 1; Leimabamba, Amazonas, 1; Huánuco, Huánuco, 1; Panao Mountains, Huánuco, 1; Huánuco Viejo, Huánuco, 1; Junín, 1; Maraynioc, Junín, 3; Chipa, Junín, 4; Obrajillo, Canta, 1;[1] Oroyo, Rio Mantaro, Junín, 4.

Merganetta leucogenis turneri Sclater and Salvin

Merganetta turneri Sclater and Salvin, Proc. Zool. Soc. Lond., p. 600, (1869), 1870—Tinta, Peru.

Range.—Known at present only from southern Peru in the upper Urubamba Valley south of 12° S. lat., from the sources of the Rio Inambari in the Department of Puno, and from Sumbay[2] in the Department of Arequipa.

Males differ from those of *berlepschi* and *garleppi* by having the mantle black (not streaked with white) and by having the edges to the scapulars and tertials reddish buff, not white or buffy white. They differ from those of typical *leucogenis* and also *garleppi* by having the under parts much darker. However, there is great variation in this feature, the type, as shown in Phillips' plate, probably representing the dark extreme. It is said to have the chest, flanks, and under tail coverts black and the lower breast and abdomen dark reddish gray broadly streaked with black. Nine adult males have been examined from southern Peru. In all these the black flanks are lacking and the nearest approach to black chests is found in three examples from the Rio San Gaban, which have black collars at the base of the white forenecks varying from one-eighth to three-eighths of an inch in width. In the two of these three specimens which have the widest collars the vents and under tail coverts are black, but in none of the other seven examples.

[1] This specimen, an adult male, is somewhat darker below than normal, approaching the lightest examples of *turneri*.

[2] Chubb (Ibis, 1919, p. 276) records three specimens from this locality and says that he has compared the only male with the type of *turneri* and finds it even darker.

The chests, breasts and abdomens of eight of these nine birds, however, are much more broadly streaked with black than in typical *leucogenis* or *garleppi*, and the ground color varies from light grayish white to light dirty buff. In one of two specimens from Limbani (the other is more typical of *turneri*) the under parts are no more broadly streaked with black than in *garleppi* or some examples of the typical race. The ground color, however, is a rusty buff more reddish than in any of the others, which may be due to immaturity, as the wing spurs are very small. The mantle is faintly streaked with white, and, as the locality, Limbani, is near the Bolivian border, the peculiarities of this specimen probably indicate an approach to the next race *garleppi*. Wings 168–175 mm.

Females and the only immature available are not distinguishable from those of the other races. Wings of females 155–161 mm.

Downy young show no difference from those of *colombiana*.

Specimens examined.—PERU: Tocopoqueu, Ocabamba Valley, 2; Huracondo Canyon, 4; Lucma, Cosireni Pass, Urubamba Valley, 1; Keatin (Quiton) River, 2; Limbani, Puno, 2; Rio San Gaban, Puno, 4; Rio Sandia, Puno, 2.

Merganetta leucogenis garleppi Berlepsch

Merganetta garleppi Berlepsch, Orn. Monatsb., 2, p. 110, 1894—Cocotal, Bolivia.[1]

Range.—The eastern Andes of Bolivia south probably to about 20° S. lat.

So far as I have been able to ascertain no merganettas have been recorded from western La Paz or Oruro and from the rather arid character of that part of Bolivia and the lack of permanent streams it would seem probable that torrent ducks are not found there. Phillips gives records for this race from Yura, southern Peru, and several localities in the Province of Tucuman, Argentina. From present knowledge there is not much doubt that the Peruvian records refer to *turneri* and the Argentine ones to *berlepschi*.

Males are very similar to those of typical *leucogenis* on the under side, but perhaps the ground color of the feathers of the chest,

[1] No locality by this name can be found on available maps. Dr. John T. Zimmer, of the American Museum of Natural History, has suggested in a letter to me that Berlepsch may have misread the original label, mistaking a capital L for a C and that the type locality is really Locotal. In support of this he called my attention to the facts that the type specimen was taken on March 14, 1891, and that in January of that year Garlepp, the collector of the type, was known to have collected at San Jacinto in the vicinity of Locotal and later, in July of the same year, was on the Rio San Mateo where Todos Santos is situated, which is in the same general area.

breast and abdomen is a little more buffy. They differ from the typical race and *turneri* by having the black feathers of the mantle edged with white, and by having the edges of the scapulars and tertials buffy gray (sometimes almost white) not reddish buff. In this latter feature, however, there seems to be some variation, one out of the five adult males examined having these edges light reddish buff, approaching some specimens of typical *leucogenis*. The mantle, however, was streaked with white. This form differs from *berlepschi* by its much lighter under parts (this feature distinguishes it also from *turneri*) and by the somewhat darker edges of the scapulars and tertials, which are whiter in the more southern race. Wings 166–175 mm.

A female is the same as in the other races. Wing 153 mm.

Only two immature specimens are available, both males, well along toward the adult plumage. They do not seem to differ from like stages in the other forms. Wings 175–179 mm.

No downy young were examined.

Specimens examined.—BOLIVIA: Incachaca, Cochabamba, 5; Yungas de Cochabamba, 1; Omeja, Yungas, 1; western Bolivia, 1.

Merganetta leucogenis berlepschi Hartert

Merganetta berlepschi Hartert, Nov. Zool., 16, p. 244, 1909—near Tucuman, 1,800 meters, Argentina (type examined).

Range.—From southern Tarija (Rio Narvaes), Bolivia, south in the easternmost Andes of Argentina to Tucuman and northern Catamarca (Lago Blanco).

The drakes of this race have the under parts dark as in *turneri* and seem to show the same great variation. Dabbene (El Hornero, 4, p. 34, pls. 3 and 4, 1927) has called attention to this, but has ascribed the differences to age rather than individual variation. Specimen number 1 (and 1, *a*) shown in his plate 3 is of course an immature. However, from the variations I have seen in specimens of *turneri* and *armata* (which *always* has a black chest) I believe the differences in coloration of the other eight male specimens shown in Dabbene's plates are due entirely to individual variation, although it may be that sometimes a more reddish ground color to the breast is due to immaturity.

The type in the Tring Collection of the American Museum of Natural History has been examined and proves to belong to the dark extreme. An adult male (with large wing spurs) from Lago Blanco, Province of Catamarca, is much lighter, having the under parts

fairly heavily streaked with black on a rather light buff background. This locality is the most western and almost the most southern recorded for this race, but the specimen shows no tendency toward *armata* in the dark markings of the head and neck. Indeed, on the under side it approaches *garleppi* more nearly, in coloration. Another specimen from Tarija, Bolivia, in the author's collection, has the chest and upper breast very heavily streaked with black, only the extreme edges of the feathers being white, but the flanks, abdomen and under tail coverts are much lighter. The feathers of the mantle, scapulars and tertials are edged with white.

This race is simply *turneri* with white edges to the feathers of the mantle and white or buffy white (not reddish buff) edges to the scapulars and tertials in the males. From typical *leucogenis* it can be told by the above characters and by its darker under parts, which latter feature also distinguishes it from the adjoining race *garleppi*. Wings 175–184 mm.

The single female examined has deep ferruginous under parts. Wing 166 mm.

No immatures or downy young were available for examination.

While on a collecting trip in Argentina I was shown by the collector Rodriguez a photograph of what he said was the nesting site of a pair of torrent ducks in Tucuman. It was about seventy-five feet above a stream on the face of a steep cliff, the nest itself being hidden beneath a bush.

Specimens examined.—BOLIVIA: Rio Narvaes, Tarija, 1.—ARGENTINA: Tucuman (the type), 1; Rio Norco, Tucuman, 1; Lago Blanco, Catamarca, 2.

Merganetta armata Gould

Merganetta armata Gould, Proc. Zool. Soc. Lond., 9, p. 95, 1841—"Andes of Chile, lat. 34°–35°"=Province of Colchagua.

Merganetta fraenata Salvadori,[1] Cat. Bds. Brit. Mus., 27, p. 458, pl 5, fig. 1, 1895—"Central Chile."

Range.—The Andes of Chile and Argentina[2] from Coquimbo (Balala, Rio Turbio) and Mendoza (Valle Hermoso) south to

[1] *Merganetta fraenata* Salvadori is supposed to differ from *armata* by having the black stripe from the throat to the eye extending to the crown, and by having the under parts paler reddish with the black shaft streaks broader. Examination of twelve adult males shows that all these characters are due to individual rather than geographic variation.

[2] Records from Jujuy and Tucuman in northwestern Argentina as given by Phillips and others belong under *Merganetta leucogenis berlepschi*.

Chubut (Rio Cholila and Rio Epuyen), Aysen (Rio Nirehuao, 46° S. lat.) and Tierra del Fuego (Lago Fagnano).

This form has been given full specific status not only because of the very different throat and facial markings of the male (which seem to be deep-seated characters since they are the first features of the adult plumage to make their appearance in the immature), but also because its range appears to be entirely separated from that of the forms to the north and east. From *M. l. turneri* and *M. l. garleppi* it is cut off by the desert region in northern Chile and western Bolivia, while from *M. l. berlepschi* it is separated by the extension of this same arid region into northwestern Argentina in the provinces of Los Andes, Catamarca (western part) and La Rioja.

The males of this species can always be distinguished by their black throat and the black stripes from the eyes to the throat and down the white foreneck to the black chest. This stripe on the foreneck, however, is sometimes partially obsolete. Above, the mantle is much whiter (often practically pure white) than in *berlepschi* or *garleppi* and the edges to the scapulars and tertials are pure white and broader than usual in those forms. The chest is always black but in the twelve specimens examined there is considerable variation in the coloration and markings of the breast, flanks and abdomen. The ground color runs from Tawny to Tawny Ochraceous of Ridgway and the black shaft stripes in some specimens are broad and in others practically obsolescent. The color of the under tail coverts varies from tawny to black, heavily vermiculated with white. None of this seems to be attributable to age, for a young male with very small wing spurs, but in fully adult plumage, can have all its color characteristics matched by older specimens with well-developed wing spurs. In fact this young male, while it has a tawny breast and abdomen with practically obsolescent dark shaft streaks, has black flanks and as dark under tail coverts as any of the other specimens examined. Wings 175–183 mm.

Females are the same as the darkest-breasted specimens of the forms of *leucogenis*. The ten specimens examined show no variation in this respect. Wings 155–164 mm.

Immatures are similar to those of typical *leucogenis*, having the fine dusky speckling on the posterior parts of the cheeks and sides of the neck. In this species, however, there seems to be a stronger tendency toward a reddish spotting on the under parts. The four youngest examples examined (primaries not yet fully grown) have the lower neck, chest and upper breast dappled with light rusty. In three

of these the dappling is very light, in the fourth much heavier. This rusty coloring, strange to say, seems to have no sexual significance, as an older example with the black facial markings of the male well advanced has an even heavier dappling of rusty about the head, neck and chest. Perhaps it is this reddish speckling that is responsible for suggestions that the young males go through a female stage with cinnamon-colored under parts before assuming the full adult plumage.

In young males the first adult feathers to make their appearance are the black ones of the throat. At about the same time a few of the white-edged scapulars come in, followed by the tertials and the feathers of the mantle. Not until the black head markings are almost completed do the black chest feathers begin to appear, after which come the tawny black-shafted ones of the breast and abdomen.

The first adult characters to show in the young females seem to be the dusky and white vermiculations on the posterior cheeks and sides of the neck. The rufous of the under parts first appears on the cheeks, throat, foreneck and under tail coverts and finally on the chest, flanks and the rest of the under parts. This first reddish coloring is just as dark as in the adults; therefore there seems to be no intermediate stage with the under parts light cinnamon-rufous.

Downy young are identical with those of *colombiana.*

A correspondent, Mr. Victor Ricke of Lautaro, Cautin, Chile, has sent some information concerning the nesting of this duck. I quote from his account: "Last October I found a nest of *Merganetta armata* with five eggs here (Lautaro) on the banks of our overflow canal at our hydroelectric plant, a short distance before the water returns to the Cautin River. The nest in question was about one meter above the canal (water) level. While the female sat on the nest, the male kept watch from the opposite bank. This circumstance led me to find the nest, which was very well hidden in the tall grass. It was necessary to climb down with a rope to reach the nest. The eggs are elongated, similar in color to those of the domestic duck. I took away two eggs first and the female kept on sitting on the nest. When I took away the others, both the female and male abandoned the place. . . . The nest was made with dry grass and had plenty of feathers." From a photograph and a sketch enclosed with the above description I judge the nest to have been situated in a hollow in the almost vertical side wall of the canal about ten feet from the top and three feet above the water. Some fifty feet downstream from the nest, the canal ended, the water falling about

thirty feet into the Cautin River. In another letter Mr. Ricke speaks of finding a second nest on the Cautin River on December 1, 1938, containing four eggs, but later speaks of both nests as having five eggs. A female taken at Lautaro, Cautin, December 8, is marked as nesting.

In the series of specimens examined is a downy from Coquimbo taken in November and another from Cautin taken in January. There are juveniles with the primaries not fully grown shot in January and March, while older ones just starting to show some adult feathers were collected in February and March. Specimens taken in April, June and July are halfway along toward their final plumage. It seems therefore that these ducks probably attain their adult dress by the time they are a year old.

It has been suggested by some that these ducks cannot swim against the current in the swift streams in which they live. While in some places this may be true, I have personally seen a pair swim against a swift current for well over a hundred yards, and then hold themselves stationary in the midst of it, while they watched me as I crouched on the bank.

Specimens examined.—CHILE: Guanta, Coquimbo, 1; Balala, Rio Turbio, Coquimbo, 2; Rio Blanco, Santiago, 1; Santiago, 2; Baños de Cauquenes, Rio Claro, 5; Colchagua, 3; Lautaro, Cautin, 10; Villa Rica, Cautin, 2; Casa Richards, Rio Nirehuao, Aysen, 2; unspecified, 5.—ARGENTINA: Las Lajas, Rio Agrio, Neuquen, 1; Bariloche, Rio Negro, 1; Rio Quemquemtreu, Rio Negro, 1; Rio Epuyen, Chubut, 1; Rio Cholila, Chubut, 1.

KEY TO MALES OF *Merganetta*

Throat and foreneck white.
  Mantle brownish gray finely vermiculated with white ... *M. colombiana*
  Mantle black or black streaked with white ... *M. leucogenis*
    Mantle black (sometimes washed with olive).
      Under parts not heavily streaked with black ... *M. l. leucogenis*
      Under parts heavily streaked with black ... *M. l. turneri*
    Mantle black streaked with white.
      Under parts not heavily streaked with black, edges to scapulars buffy gray ... *M. l. garleppi*
      Under parts heavily streaked with black, edges to scapulars buffy white or white ... *M. l. berlepschi*
Throat and foreneck black, a black stripe from the throat to the eye ... *M. armata*

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